

CHEMICAL ABSTRACTS

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1—APPARATUS

C. G. DERRICK

Studies in evaporator design. II. W. L. BADGER AND P. W. SHEPARD. *Chem. Met. Eng.* 23, 281-4(1920); cf. *C. A.* 14, 3171.—The apparent coeff. of heat transmission in vertical tube evaporators decreases with temp. drop and approaches zero for zero temp. drop. It increases with b. p. for a given temp. drop. After correction for hydrostatic head there is but little change with temp. drop. The corrected heat-transmission coeffs. show considerable differences as the b. p. is increased and the temp. drop held const. It is impossible to represent heat-transmission coeffs. for different b. ps., different temp. drops and different steam temps. by any expression which does not consider at least 2 of these 3 factors. E. H.

Studies in evaporator design. III. W. L. BADGER AND P. W. SHEPARD. *Chem. Met. Eng.* 23, 390-3(1920); cf. preceding abstract.—Max. heat transmission with non-foaming, non-viscous liquids in a vertical tube evaporator occurs when the tubes are $\frac{1}{3}$ to $\frac{1}{2}$ submerged. The shape of the bottom of the evaporator affects heat transmission to an extent which varies with the height of the liquid. Change in heat transmission with changing liquor level is due only partly to hydrostatic head; velocity of circulation is an important factor. B. F. DODGE

Notes on laboratory and demonstration apparatus. CLIFFORD D. CARPENTER. Columbia Univ. *J. Ind. Eng. Chem.* 13, 332-3(1921).—An app. for demonstrating the vapor pressure of liquids consists of five Torricelli tubes filled with Hg and inverted over Hg in a shallow trough with an overflow so that the level of Hg in the trough remains const. One of the tubes is enclosed in a glass jacket which may be filled with H₂O of any desired temp. The liquids are introduced into the tubes by means of curved pipets and their relative vapor pressures observed from the depression of the Hg. A ringsand set which makes it possible to mount upon a single support the app. used in many expts. ordinarily requiring two or more supports consists of a base with three interchangeable rods which fit into the base by means of a "lock socket." One of the rods is straight, one is bent at right angles and the third bent so that the two portions make an angle of 75°. A convenient form of sink for lads. in elementary and general chemistry consists of three compartments. The two smaller compartments drain into the larger center compartment by a 1-in. hole which may be closed by a stopper. The smaller compartments are intended to be used for collecting gases.

G. W. STRATTON

Zeiss butyrefractometer—setting of scale. J. F. LIVERSEGE AND W. SINGLETON. *Analyst* 46, 93(1921).—L. and S. note that the standard liquid paraffin of n_D 1.474 now obtainable in England for setting refractometers does not give settings that exactly agree with those when the Zeiss fluid is used. The difference amounts to one unit on the butyrefractometer. H. S. BAILEY

A refractometer for the determination of liquid mixtures. H. H. THOMAS AND A. F. HALLIMOND. *Mineralog. Mag.* 19, 124-9(1921).—An apparatus designed to replace refractometers of the Pulfrich type for the detn. of n of immersion liquids. The new instrument depends upon the deviation of a ray of light incident on the oblique face between a prism of glass and the liquid to be detd. A direct-vision spectroscop-

is used in which the liquid takes the place of the glass prism. To eliminate errors two rays are used, derived from two opposite inclined faces of a right-angled prism placed with the hypotenuse face perpendicular to the axis of the instrument. These rays form images on both sides of the eye-piece scale, the distance between the images recording the difference in n between prism and liquid in which the prism is immersed. Readings accurate to one unit in the third decimal place can easily be obtained. If for a given ray, the n of liquid and prism coincide, the images unite at the center of the field, but in general 2 images are seen. To cover the range of liquids from 1.47 to 1.74 it is desirable to have 4 prisms with n 1.51, 1.58, 1.65 and 1.72, respectively.

W. F. HUNT

A new model rotating-stage petrological microscope. W. ALFRED RICHARDSON. *Mineralog. Mag.* 19, 96-8(1920).—An instrument designed to produce a smaller model with as many advantages of the larger types as possible. The microscope was constructed by James Swift and Son. When closed it is 12½ in. high. The body tube is 140 mm. long and 40 mm. in diam. so as to be suitable for photomicrography. The horse-shoe base is hinged above the stage to render the instrument stable in the horizontal position. The rotating stage is 120 mm. diam. and is provided with mechanical motions. The rotation is divided to read to 5' of arc, but the stage rotates only 270°. The sub-stage is of the conventional type.

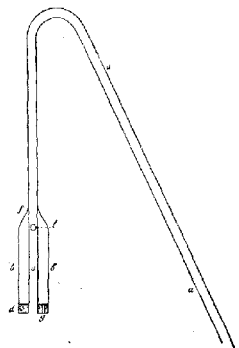
W. F. HUNT

An improved separation vessel for heavy solutions. GABRIEL LINCO. Turin. *Beitr. Kryst. Mineralogie* 1, 103-5(1916).—The chief new feature consists in openings in the lower vessel after the manner of a dropping bottle, so that liquid can be poured out without disturbing the sediment, or disconnecting the app. Made by W. Vetter and by F. Rheinheimer, Heidelberg.

E. T. WHERRY

Simple arrangement for safely heating beakers and the like in water bath. WILMA HAUKE. Munich. *Chem. Ztg.* 45, 146(1921).—To hold the beaker in position expensive rubber tubing is replaced by cord on which is strung small pieces of rubber tubing to prevent slipping of the glass.

J. J. MORGAN



An automatic siphon. C. J. PELLE. *Chem. Weekblad* 18, 127(1921).—An automatic siphon devised by P. H. Bon consists of an ordinary siphon tube, a , to which is attached a wider tube (b). Tube, a , is provided with an opening into b at l . Tube, b , is closed with a cork, d , through which a passes. This cork is perforated with a small hole g . The siphon being immersed, liquid enters into a much more rapidly than it does into b and reaching a point above l , the air in b is placed under pressure, forcing out the liquid above it, thus starting the siphon.

N. VAN PATTEN

Electron tube with highly variable resistance. WILHELM STEINHAUSEN. *Arch. ges. Physiol.* 185, 70-3(1920).—The instrument, described in detail, consists essentially of a highly evacuated glass tube with three electrodes. It offers a means of procuring easily measured and variable resistances covering such values as

can be utilized in physiol. expts.

G. H. SMITH

Inexpensive electric etching pencil. J. A. TOLEIK. *Elec. World* 77, 942(1921).—A home-made elec. pencil for marking metal containers, ringstands, and other metal app. Full illus. details are given.

C. G. F.

Ozone generators. EDWARD L. JOSEPH. Can. 210,606. Apr. 19, 1921. In an ozone generator the metallic sheet electrodes of right-angled trapezoidal shape, having

opposite polarity extend in parallel planes and are sepd. by a sheet of dielectric material. The size and arrangement of the electrodes is such that a substantially triangular portion of each electrode projects in one direction or the other, according to its polarity, beyond the corresponding edges of the dielectric sheets. Rods leading current to the electrodes pass through the projecting triangular portions of the electrodes and serve to clamp the electrode and dielectric sheets together.

Gas-cleaning apparatus. JNO. WELLS. Can. 210,171, Apr. 5, 1921.

Porosimeter. D. A. MACINNIS. U. S. 1,371,565, Mar. 15. The app. comprises a vertical tube at the lower end of which the fabric to be tested for porosity is clamped, with water-supply and over-flow connections to the tube for maintaining a const. level of H_2O in the tube above the fabric. The tube with a clamp for holding the fabric is mounted on a standard and a dish for catching the liquid passing through the fabric is provided.

Apparatus for synthesis of ammonia and other reactions under high pressures. G. CLAUDE. U. S. 1,371,299, Mar. 15. Can. 210,782, Apr. 19. A relatively thin tubular reaction chamber is surrounded with a heavy metal outer shell capable of withstanding very high pressures and an annular space between the two is filled with liquid and rings of heat-insulating material, which in the case of use of the app. for NH_3 synthesis may comprise a soln. of caustic alkalies and rings of Fe_3O_4 .

Solvent-recovery apparatus. W. K. LEWIS AND W. GREEN. U. S. 1,371,914, Mar. 15. See Brit. 152,374 (C. A. 15, 716).

2—GENERAL AND PHYSICAL CHEMISTRY

W. B. HENDERSON

Berzelius and Dalton. MAURICE DELACRE. *Mon. sci.* 11, 3-8(1921).—Berzelius erroneously coupled Richter's name with the law of definite proportions. It was Dalton who discovered the chem. symbol in its modern acceptation, and from his "law of the symbol" follow as corollaries the laws of definite and of multiple proportions.

JEROME ALEXANDER

Promotion of scientific research. WM. HOSKINS AND RUSSEL WILES. *Chem. Met. Eng.* 24, 689-91(1921).—To maintain research in pure science it is suggested that, instead of relying on voluntary com. subsidies, adequately paid university investigators properly cover their discoveries by patents available to all upon the payment of a fair royalty which will be used to finance further research. The present practice encourages pirates, who, though not the real inventors, secure patents by sharp-witted methods, and thus bilk the inventors, the universities, and the public. Licenses being open to all, litigation will not appear. The Cottrell patent is cited as illustrative of the operation of this principle.

JEROME ALEXANDER

Revision of the atomic weight of bismuth. A. CLASSEN AND O. NEY. *Ber.* 53B, 2267-70(1920).—Org. compds. are suggested as being more suitable than inorg. for this type of work because of the tendency of the latter to form basic complexes. The authors chose bismuth triphenyl because it can be prepared in a pure state. The average of ten analyses in which the bismuth is weighed as Bi_2O_3 gives an at. wt. of 209.00. This agrees with the recent work of Hönigschmid, whose value was 209.02 as against the accepted value of 208.

E. D. WILLIAMSON

A new periodic relationship among the atomic weights of the chemical elements. V. The calculation of Rydberg's constant. KARL FIEHLKE. *Physik. Z.* 22, 60-2(1920).—The series spectra are caused by stresses which are due to imperfect resonance between the vibration of the atoms of a mol. and that of complexes of a number of n' mols., where n can be any integer. This stress- or potential energy is equal to one half the change in rotational energy caused by the atom assuming the angular velocity corre-

sponding to that change of the moment of impulse which will be necessary for reaching a state of resonance with the complex in whose dynamic influence it finds itself. The behavior of the angular velocity is the same as though all atoms of the complexes were combined on a single spherical surface. The line-spectrum formula deduced from these assumptions with the help of the atom model and consts. taken from his previous work (cf. *C. A.* 14, 3174-5; 15, 195) is similar in general form to Bohr's. The const., although embracing entirely different magnitudes and deduced from fundamentally different assumptions, is the same to two decimals as the Rydberg const.

A. E. STEARN

What is valence? ALFRED BENRATH. *Z. angew. Chem.* 33, Aufsatzteil, 289-90 (1920).—This is a brief exposition of the principles which should be followed in determining the principal valence of an element in a compd. *E. g.*, an element cannot exercise both + and — valence simultaneously. In many compds. the presence of Werner's auxiliary valences must be taken into consideration. The value of an element's principal valence is not changed by the presence of auxiliary valences, but only by oxidation or reduction. Typical compds. of N, P, C, and B are studied from this point of view.

R. H. LOMBARD

The rectilinear diameter of hydrogen. E. MATHIAS, C. A. CROMMELIN AND H. KAMERLINGH ONNES. *Compt. rend.* 172, 261-3 (1921).—The densities of liquid H and of its *satd. vapor* have been detd. between the critical temp., -239.91° , and the b. p., -252.76° . From these data, and from previous values for the d. between the b. p. and the solidifying point, the ordinates, y , of the rectilinear diameter have been calcd. $y = -0.063510 - 0.00039402 \theta$, where θ is the temp. on the abs. thermodynamic scale. The angular coeff. of the rectilinear diam., $\alpha = -0.00039402$, is the smallest which has ever been found. From the equation of the diam., the critical density of H is found to be $\Delta = 0.03$. The critical coeff., $R\theta\Delta/\pi = 3.276$, where R is the gas const., and π the critical pressure, is also the smallest value of this const. yet found. For the most part, the deviations from the diameter do not exceed 0.1%. Therefore, it is concluded that H obeys the law of the rectilinear diameter. However, the deviations of the 3 points of the diameter nearest the critical point are greater, the largest being 0.5%. N and A show similar deviations, which are as yet unexplained, although they may quite possibly be due to exptl. errors. In a later paper will be given the value of the heat of vaporization of H, N, O and A, calcd. from their diameter and the pressure of their *satd. vapor*.

R. H. LOMBARD

Notice on the softening of carbon. JULIUS GMACHEL-PAMMER. *Tech. Hochschule Graz. Monatsh.* 41, 467-76 (1920); cf. Plotnikov, *C. A.* 12, 248.—Impure C rods are more flexible than pure. However, the softening is a property of the C itself, for it was observed in rods containing less than 0.1% ash. Graphite rods soften at a much higher temp. than elec. arc carbons. Those arc carbons which have been in use for some time do not soften as readily as the new ones, owing to their change into graphite.

C. J. WEST

The melting point of ammonium sulfate. JAMES KENDALL AND ARTHUR W. DAVIDSON. *J. Ind. Eng. Chem.* 13, 303-4 (1921).—Since the literature shows extreme discrepancies in the recorded m. p. of $(\text{NH}_4)_2\text{SO}_4$, careful detns. were made which showed that the m. p. of NH_4HSO_4 is $146.9^{\circ} \pm 0.5^{\circ}$, and of $(\text{NH}_4)_2\text{SO}_4$ is $513^{\circ} \pm 2^{\circ}$. Jänecke's figures were 251° and 359° , resp.

JEROME ALEXANDER

Determination of melting points. C. D. CARPENTER. *Chem. Met. Eng.* 24, 569-71 (1921).—C. points out the general disagreement in m. p. values of different observers. An improved app. includes a stirrer, well lagged beaker, and a Pt-resistance thermometer with its Wheatstone bridge, galvanometer, and reading scale. The stirrer is adjustable as to speed and may be raised or lowered. The stirring app. is entirely independent. The beaker is wrapped with moist asbestos which has two small holes on opposite sides

of the beaker, to permit observation of the behavior of the compd. when the tube or bulb is lowered in the bath until in front of the window, with a light in front of the hole on the opposite side. In the app. illustrated the bath consists of a mixt. of KNO_3 and NaNO_3 . Typical cases as regards nature of the compd. include: (1) those stable above the m. p., inert towards glass or quartz, (2) those undergoing very slow decompn. or acting very slowly on glass or quartz, (3) volatile below, or undergoing rapid decompn. at the m. p., (4) those acting vigorously on transparent tubes, glass or quartz, but inert toward metals or C, (5) m. ps. of hydrates or substances difficult to obtain pure but readily estd. when mixed with a second component. C. detd. the m. p. (357.1) of KClO_3 by a new method.

W. H. BOYNTON

Determination of the coefficient of cubical expansion and the specific gravity of molten copper; and influence of the absorption of gas on the contraction of cast copper. W. STRAM. *Metall. u. Erz* 16, 443-4(1919).—The coeff. of cubical expansion of pure molten Cu is 0.000054, while that of molten Cu after refining by the poling process is 0.0000436. The difference is due to the absorption by the molten metal of H and CO, which are partly evolved on cooling and partly remain in blowholes, thus causing the sp. gr. to be lowered from 8.95594 to between 8.3 and 8.6. The sp. gr. of pure Cu at 1165° is given as 8.4322.

J. S. C. I.

The theory of molecular compounds. PAUL PFEIFFER. *Z. anorg. allgem. Chem.* 112, 81-96(1920).—In certain respects Werner's coordination formulas, as applied e. g. to the cobaltamines, are unsatisfactory. It is difficult to understand, for instance, in the hexamine chloride, $\text{Co}(\text{NH}_3)_6\text{Cl}_2$, how the field of affinity between the Co and Cl atoms can extend over the field of affinity of the NH_3 mols., especially in view of the strong affinity between H and Cl. The variation of the total valency of Co between 6 and 9 in the cobaltamine group is also difficult to understand. P. applies the principle of "affinity adjustment of the valencies" to overcome the difficulties. In mol. compds., such as the cobaltamines, the Co atom is assumed to have a fixed coordinative valence of 6, corresponding with the number of groups in the inner sphere of Werner's formulas. The ionizable radicals or atoms in the outer sphere are then considered to be combined with the complex radical as a whole, not attached definitely to the Co atom nor to any of its associated mols. The same idea is applied to the complex Pt salts. Complex org. mol. compds., such as those formed between aromatic hydrocarbons and di- or tri-nitrobenzene, or between hydrocarbons and quinones, are also considered. There is in general no connection, e. g., between the number of nitro groups in a compd. and the number of aromatic nuclei with which it will combine. In such cases, the compds. are formed by the satn. of polyatomic valence fields on both sides. In some cases it is conceivable that a polyatomic valence field may be satd. by combination with a monatomic field, for instance, when a quinone, with two unsatd. carbonyl O atoms, combines with two benzenoid nuclei. In other classes of compds. for instance the compds. between SnCl_4 and two mols. of a ketone, a compd. of the coordinative type may be formed, the Sn in this case having a coordinative valency of 6, thus:



In the crystal structure of simple org. mol. compds. of the type AB_6 , it is probable that each constituent acts as a coordination center, so that complexes of the type AB_6 and BA_6 interpenetrate, as they do in a rock-salt crystal. This would explain the predominance of the simplest type of such mol. compds.

J. C. S.

Irregularity of coefficient of expansion accompanying the magnetic transformation in pyrrhotite and magnetite. P. CHEVENARD. *Compt. rend.* 172, 320-2(1921).—The coeff. of expansion of pyrrhotite exhibits a discontinuity at about 320° . This effect apparently accompanies a change of phase. The coeff. of expansion of magnetite

reaches a max. at about 570° but there is apparently no change of phase at that point.

E. D. WILLIAMSON

The kinetic theory of gases in the light of the theory of relativity. RUDOLPH MEWES. *Z. Sauerstoff. Stickstoff. Ind.* 12, 33-4(1920).—A connection has not yet been established between the kinetic theory of gases or its laws and the theory of relativity developed by Lorentz, Gerber, Einstein, and Minkowski. M.'s previous expts. and new calcns. open the possibility of developing a dynamic theory of gases and vapors on the basis of the general law of action of mass.

J. C. S.

The solubility of earth-acid gels (titanic, tantalic and columbic acids) in hydrogen peroxide-acid mixtures. OTTO HAHN AND HANS GILLE. *Z. anorg. allgem. Chem.* 112, 283-92(1920).—For the sepn. of titanic, tantalic, and columbic acids from most other elements, a method was given by Weiss and Landecker (*C. A.* 4, 432) which consisted in dissolving the acids, whether pptd. from acid or basic solns., in H_2O_2 and reprecip. by boiling the soln. with H_2SO_4 . Expts. on the soly. of these acids in acid solns. of H_2O_2 have not confirmed Weiss and Landecker's statements. The acids used for the expts. were prepd. by fusing the com. material with $NaHSO_4$, extg. with boiling water, and hydrolyzing the solns. by boiling with H_2SO_4 . Titanic and columbic acids are practically completely sol. in acid H_2O_2 , but tantalic acid when pptd. hot is almost insol., and when pptd. cold is only partly sol. In mixts., the different acids influence one another differently according to the conditions. Tantalic acid lowers the soly. of columbic acid, while titanic acid may increase the soly. of tantalic acid or may itself be rendered less sol. Expts. with the ultra-microscope indicate that, in acid H_2O_2 solns., titanic acid forms a true soln., while columbic and tantalic acids form colloidal solns.

J. C. S.

The influence of lead on the catalytic activity of platinum. EDWARD BRADFORD MAXTED. *J. Chem. Soc.* 117, 1501-6(1920).—The poison effect of Pb for a given quantity of Pt catalyst is a linear function of the quantity of Pb. One mg. of Pb appears to inhibit completely the catalytic activity of 8.8 mg. of Pt as shown by the velocity of absorption of H_2 by oleic acid induced by catalytic Pt. This velocity of absorption is shown to vary directly with the wt. of Pt, and so the view is advanced that a given quantity of Pb poisons a certain definite wt. of Pt while the residual Pt remains capable of functioning normally. These results are analogous to those observed on the inhibition of occlusion of H_2 by Pd due to H_2S (cf. *C. A.* 15, 197).

A. E. STEARN

Influence of mercury, sulfur, arsenic and zinc on the catalytic activity of platinum. E. B. MAXTED. *J. Chem. Soc.* 119, 225-33(1921).—The rate of absorption of hydrogen by 3 cc. of oleic acid dissolved in 9 cc. of acetic acid in the presence of 5 mg. of active platinum is const. almost to the satn. point both with and without poisons. Thus the catalytic activity may be given in terms of the number of cc. of hydrogen fixed per minute. The inhibitive effect of mercury is a linear function of the mercury present in the reacting mixt. almost down to complete extinction of activity, one mg. of mercury in the above mixt. being sufficient to reduce the activity by 90%. The residual catalytic activity decreases less rapidly with increasing mercury content. With sulfur this point is somewhat lower than with mercury, while arsenic and zinc deviate from the linear course at a slightly higher point.

JAMES M. BRILL

Combustion of charcoal in the presence of oxides. E. BERGER AND L. DELMAS. *Bull. soc. chim.* 29, 68-77(1921).—Powdered wood charcoal (A) or lamp black (B) was mixed with 4% of the oxide to be tested, with 1% of a 20% dextrin soln. as an agglutinant, and compressed to form cylinders 18 mm. in diam. by 15-20 mm. high. These were dried for a day at 100° before testing. A, treated to remove most of the ash, burned much less freely; addition of CoO , CuO , or Sb_2O_3 aided combustion markedly. CuO was more effective with B, which with MoO_3 , Sb_2O_3 , PbO , and $PbCrO_3$ also burned freely, although with other oxides or without treatment, it did not burn. The volume

ratio of $\text{CO}:\text{CO}_2$ was 13–20% for untreated A, while most of the oxides tended to reduce this, the most effective being oxides of Ag, Mn, Co, Ni, and Cu in the order named. Similar figures are given for B. V_2O_5 and perhaps PbCrO_4 appear to increase CO formation. The oxides which are most effective in aiding combustion appear to fulfill the condition of being reducible and reoxidizable at relatively low temps.

BEN H. NICOLET

Comparative study of the decomposition of a dissociable mercurous chloride obtained from mercuric chloride and of the ordinary form. GAMBIER. *Ann. malad. vénér.* 15, 28–31.—Duret's observations (*C. A.* 13, 2734) are confirmed, and by variation of the pptg. and reducing agent, it has been found possible to obtain a more voluminous and still more readily dissociable prepn. which is quite free from HgCl_2 . The sepn. of free Hg has been estd. colorimetrically. The prepn. gives 2.0 times at 15° , 2.4 times at 30° , 2.66 times at 60° , and 1.5 times at 100° as much Hg as does ordinary calomel, and the equil. between eliminated Hg and the unchanged mol. is very rapidly attained.

J. C. S.

Lecture experiments. Critical examination of well known experiments with metallic sulfides. R. WINDERLICH. *Z. physik. chem. Unterrichts.* 33, 100–3(1920).—Strictly speaking, the union of Fe and S cannot be used as an illustration of the law of const. compn. or as an obvious illustration of the differences between mixts. and compds. A mixt. is preferably demonstrated by finely powdered quartz and salt; the mixt. of flowers of S and Fe filings affords a simple example of a chem. process which, started at one point, proceeds through the whole mass by reason of the great heat of reaction. The statement, common in many elementary texts, that H_2S does not give a ppt. with solns. of ferrous salts is true only when the latter contain mineral acid. The proportions of S and oxide of Fe prescribed for demonstration are not in accordance with the amts. calcd. from the equation $2\text{Fe}_2\text{O}_3 + 7\text{S} \rightarrow 4\text{FeS} + 3\text{SO}_2$, partly because an excess of S must be taken to counterbalance that lost by volatilization, and partly to inhibit the formation of sulfate, which occurs in the presence of a deficiency of S.

J. C. S.

Calculation of the specific heats of gases. W. HERZ. Univ. Breslau. *Z. Elektrochem.* 27, 125(1921).—It is shown that $c_p - c_v$ can be calculated from crit. data and also from the heat of vaporization (L) of non-associated liquids at the b. p. (T_b), by means of the equations: $c_p - c_v = 0.0935 p_b / T_b d_b$, and $c_p - c_v = 0.0935 L / T_b$. Values calcd. with these equations agree fairly well with those detd. exptly.

H. J. CREIGHTON

Vapor pressure regularities. IV and V. W. HERZ. Univ. Breslau. *Z. Elektrochem.* 27, 125–6(1921); cf. preceding abstract and *C. A.* 14, 1243.—By the introduction of the coeff. of expansion (K) of the expression $T_b = 0.5[(1/K_{10}) + 293]$ into the van der Waals vapor pressure formula, there is obtained the equation $\log p_b/p_0 = a[(K_{20}/588) - 0.5]$. For a number of org. liquids the const. $a = 3$ approx. It is pointed out that Cederberg's formula for the mol. heat of vaporization λ , i. e., $(\lambda/T_b \log p_b) [1 - (T_b/T_k)] / [1 - (1/p_k)] = C = 4.57$, yields with org. compds. higher values for the const. than 4.57. In homologous series the value of this const. increases with increase in mol. wt.

H. JERMAIN CREIGHTON

Vapor pressures and the isothermals of vapors. J. H. SHAXBY. Univ. College, Cardiff. *Phil. Mag.* 41, 441–54(1921).—In "ideal" substances the ratio of the occupied vol. (co-vol.) to the total vol. of a liquid is equal to the same ratio inverted in the satd. vapor. The two phases in equil. are complementary in this respect. The relation is nearly true for actual fluids. The equation for the satn. pressure (p) of a vapor in terms of the temp. (T) and the densities of the 2 phases (d_1 and d_2) at that temp. is: $p = RT(d_1 + d_2)(d_1/d_2)^{(d_1 + d_2)/(d_1 - d_2)}$ which leads to an equation of state $p[v - 1/(d_1 + d_2)] = RT(d_2/d_1)^2/(d_1 - d_2)^2$. The quantity $d_1 + d_2$ may be regarded as a density factor which is a measure of the cohesive forces per unit m . On the hypothesis that for actual substances there is a "density" proportional to the cohesive forces.

nearly, but not exactly equal to $(d_1 + d_2)$, modified forms of equation (1) and (2) are obtained. These equations express the exptl. facts with considerable accuracy for all temps. and pressures. "Reduced" forms of the vapor-pressure equation are obtained and also an equation for the calcn. of the critical d. of a substance, which gives consistent values, even in cases such as that of water where the Mathias rule fails.

S. C. LIND

Disglomeration: a new mode of transformation of solidified metals. A. THIRL. *Sitz. Ges. gesamt. Nat. Marburg* 1920, i, 1-17.—The allotropy of Pb does not play any part in the transformation of Pb according to Heller's expts. (*C. A.* 9, 2338) (cf. also Cohen and Heldermaun, *C. A.* 9, 2338). Disglomeration (disintegration in consequence of the soln. of the eutectic formed by Pb and its impurities and located between the Pb crystals) is a consequence of the chem. action of the dissolved nitrate and formation of Pb nitrite. Disglomeration occurs only with solidified metals (Cu in addition to Pb). Formation of the Pb tree is observed only when local, short-circuited, ionic concn. cells are developed. All types of Pb which sep. as the Pb tree are crystallographically identical with that which has crystd. from the molten metal; the earlier explanation of the phenomenon as being due to allotropy is, therefore, excluded.

J. C. S.

The behavior of an in soluble electrode in the equilibrium process $3\text{HNO}_2 \rightleftharpoons 2\text{NO} + \text{HNO}_3 + \text{H}_2\text{O}$. ALFONS KLEMMENC. Univ. Vienna. *Z. Elektrochem.* 27, 110-3 (1921). —Examples are given which show that an insol. electrode, if immersed in the system $\text{HNO}_3 - \text{HNO}_2 - \text{NO}$ when in equil., causes the reaction $\text{NO} + 2\text{H}_2\text{O} + 3\oplus \rightarrow \text{H}^+ + \text{NO}_3^-$ to take place. With dil. solns. a 2nd reaction occurs: $\text{NO} + \text{H}_2\text{O} + 1\oplus \rightarrow 2\text{H}^+ + \text{NO}_2^-$. There is no evidence in the concn. interval investigated that the electrode effects the reaction $2\text{NO}_2^- + 1\oplus \rightarrow \text{NO}_3^- + \text{NO}$, as has been assumed by Pick (*C. A.* 14, 3561).

H. JERMAIN CREIGHTON

Measurement of electroösmotic tensions in liquids of low conductivity. W. STASZKOWSKI. *Krakau Anzeiger* 1917A, 269-78.—The term electroösmosis is considered to denote the transport of a fluid along the surface of contact with a solid substance under the influence of an elec. current; the converse phenomenon, the development of a current by the movement of two media along the surface of contact, is termed current stream. The movement of a liquid along the walls of the containing vessel when, e. g., the fluid is positively charged relatively to the wall, causes a transport of electricity in the direction of the flow. Under the influence of the external electric field the charged liquid layer is set in motion, and carries with it the neighboring particles in consequence of internal friction. If K is the dielec. const. λ the sp. cond., μ the coeff. of internal friction of the liquid, $(\phi_1 - \phi_0)$ the difference of potential of the elec. double layer at the surface of contact of liquid and wall of tube, and P the difference of pressure at the ends of the capillary, the current developed by the flow of liquid in the capillary can be calcd. from the formula $E = K(\phi_1 - \phi_0)P/4\pi\lambda\phi$. In the present communication, which is devoted to the proof of this theory (as far as the dependence of electroösmotic tension on external pressure is concerned) and to the estn. of the const. $K(\phi_1 - \phi_0)$ of poorly conducting substances, S. uses a method which depends on the measurement of the e. m. f. induced by driving a liquid through a capillary. The expts. were performed with nitrobenzene, Et_2O , and mixts. of EtOH and toluene, and have shown that a proportionality exists between the electroösmotic tension B , and the external pressure P . Further mixts. of alc. and toluene show analogous variations with respect to λ and $K(\phi_1 - \phi_0)$; both values decrease with the toluene content, slowly in mixts. poor in toluene, but rapidly in those rich in this substance, so that the ratio $K(\phi_1 - \phi_0)/\lambda$ remains of the same order of magnitude, while λ diminishes in the ratio 1:10,000. There appears, therefore, to be an intimate relationship between the structure of the elec. double layer and the mechanism of elec. cond. Further measurements show that a

marked increase in the cond. of a poorly conducting liquid raises the potential difference at the surface of contact with the solid substance. J. C. S.

A new method for the estimation of electrolytic conductivity of solutions. JOHANNES CHRISTIANSEN. *Hospitalstidende* 63, 297-302.—A vessel with the liquid under investigation and a voltmeter are connected in series in a d. c. circuit of known potential. If the resistance of the vessel is not negligibly small compared with that of the voltmeter, the latter does not indicate the known potential, but some lower value. A convenient vessel for the *examn. of urine* is formed by a U-tube, the greater part of which is constructed from a capillary tube 32 cm. long and 1.8 mm. in diam. The app. is calibrated with the aid of solns. of known cond. The method is useful when rapid estns. are required which need not be performed with extreme accuracy. J. C. S.

Impulsive sparking voltages in small gaps. J. D. MORGAN. *Phil. Mag.* 41, 462-70 (1921).—It has been found that the impulsive sparking voltage is greater in certain gaps than the static sparking voltage. When an increasing voltage is rapidly applied the value attained before sparking occurs is greater than that when gradually applied. The ratio of the two has been termed the impulse ratio. The sparking voltage depends on 3 conditions: (1) rate of rise of voltage, (2) the time of continued action after a certain value is reached, and (3) the initial ionization of the gap. The rate of rise depends on the app. used. For a given kind of app. it can be varied by changing the primary current, other circuit conditions remaining const. Initial ionization varies with atm. conditions but can be rendered artificially const. The element of time varies with the other 2 conditions and is different for different gaps (for which graphs are given). Two gaps differing in form but having the same static sparking potential will have different impulsive sparking voltages. The subject has direct application in connection with the *ignition of gases* by induction-coil sparks, ignition in internal-combustion engines, protective gaps for elec. machinery, and overhead transmission systems subject to rapid elec. impulses. S. C. LIND

Refraction of media in motion in relation to the experiment of Michelson and Morley. A. SKILLARIO. *Nuovo cimento*, 20, 5-18 (1920).—When a plane wave of light strikes a refracting medium which is in translatory motion there is a virtual rotation of the refracting surface due to such motion. S. derives a simpler equation than Righi (*Nuovo cimento* 16, 213 (1918) for this angle of rotation of the refracting surface. Letting ω be this angle— $\tan \omega = (v/V) \sin i / [1 - (v/V) \cos i]$ where v = velocity of refracting surface, V = velocity of light, $i = 90^\circ$ — angle of incidence. S. also shows that the rotation of both surfaces of a plate with parallel sides is the same, both on the hypothesis that the ether is in motion, according to Fresnel, and also on the hypothesis that it is at rest. By pointing out that the same expression holds for a prism, S. shows that the formulas are good even for a surface which is not perfectly plane. He observed that, since for a moving surface there is a virtual rotation of the refracting surface, the refracted wave cannot take the path after refraction which it would have if the surface had remained parallel to itself, and, therefore, the refracted wave cannot be retraced to the incident wave. Thus, Huygens' principle of the interchangeability of the incident and refracted wave fails in the case of moving refracting media.

A. W. CONTIERI

A comparison of monochromatic screens for optical pyrometry. W. E. FORSYTHE. Nela Research Lab., Cleveland, O. *J. Optical Soc. Am.* 5, 85-95 (1921).—Screens of Jena red glass, a Corning Co. green glass, and blue violet glass were compared to find their relative efficiency. Seven observers, of various degrees of experience, used the 3 screens for different temps. The precision of setting was about the same for red and green (to about 5°), 3 times as poor for the blue. Four reasons are given, however, for preferring red to green. (1) It goes to lower temps. (2) The color changes less with wave length; poorer color matches are obtained with the green when the intensity of

the measured light is cut down. (3) Better reds can be obtained, that is, reds with a steeper slope to the transmission curve on the visible side. (4) The red glass permits the use of an absorbing green or sector of greater transmission than the green allows. Thus: to insure 3100° K. by means of a pyrometer lamp going (effectively) to 1800° K. for red glass the absorbing glass or sector must have a transmission of about 0.0054; for green glass, 0.0017; for blue, 0.00061. Since small transmissions are hard to measure it is better to use red glass for very high temps.

W. P. WHITE

The saturation value of magnetization of cementite. SHIZO SAITÔ. *Sci. Res. Tôhoku Imp. Univ.* 9, 319-22(1920).—Cementite was electrolytically isolated from a steel containing 1.58% C and pressed into the form of a cylindrical rod. The density, ρ was 4.35. The intensity of magnetization was measured in the field of a Du Bois electromagnet. The magnetization reached satn. in a field of over 10,000 gaussess, the value found being $\sigma = 1/\rho = 135$ C. G. S. units. Measurements were also made on white cast iron containing 3.75% C. From the known proportion of ferrite and cementite and from the measured satn. value of the specimen the satn. value of cementite was calcd. to be $\tau = 955$ or $\sigma = 1/\rho = 135$, which is the same value as was found directly. The same measurements were made for the double carbides of Fe and W and of Fe and Cr and also for a number of different steels and the results are given graphically.

F. P. PHILIPS

Solvents for phosgene. CHARLES BASKERVILLE AND P. W. COHEN. *J. Ind. Eng. Chem.* 13, 333-4(1921).—Of the ten solvents tried benzene and ethyl acetate dissolved their own wt. of COCl_2 without reacting with it. It is suggested that such solns. might be used against moles, rats and similar vermin.

JEROME ALEXANDER

Cohesion forces of the diamond (THIRRING) 3. Thermochemistry of ionization of vapors of certain compounds (FOOTE, MOHLER) 3. Lime mortars: solution and conversion of solid substances into colloids (KOHLSCHÜTTER, Walther) 20. Chemical equilibrium between iron, carbon and oxygen (MATSUBARA) 9.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

The structure of the molecule and chemical combination. J. J. THOMSON. Univ. of Cambridge. *Phil. Mag.* **41**, 510-44(1921).—The results are in part those given by T. in his lectures at the Royal Inst. 1914-19. It is pointed out that a system consisting of rotating electrons is unstable, and T. assumes that the electrons in an atom are held in equil. by their mutual repulsions obeying the usual law of the square of the distance, and attraction between the nucleus and the electrons obeying a more complicated law function $(c)/(r)$, in which r is the distance between the positive charge and the electron, and c is a length. When r is either very long or small compared with c , $\phi(c)/(r)$ re-

duces to $1/r^2$, but when r is of the same order as a , the force vanishes at certain distances and changes from attraction to repulsion or *vice versa*. From the laws of attraction and repulsion, T. deduces a general equation $r = Na/[n - (S_n/4)]$, in which N is the at. wt., n the number of electrons in the outer ring, and α is a const., $S_n = \Sigma(1/\sin \theta)$, where 2θ is the angle subtended at the center of the atom by the line joining the 2 atoms in the outer ring. T. shows that the change of at. vol. predicted on passing through the periodic system is that to be expected and in accord with the expts. of W. L. Bragg (*C. A.* 14, 3584). The work necessary to remove an electron from the atoms of several of the lighter elements is calcd. on the basis of 2 different modes of removal. The formation of mols. from atoms is discussed and various modes are given. The development of this phase of the subject is quite similar to that employed previously by Lewis and by Langmuir and in general similar conclusions are reached. The question of the stability of the various possible positive and negative ions is considered in the light of the experience gained by positive-ray analysis. S. C. LIND

Rutherford's experiments on the subdivision of the nitrogen nucleus. W. LÄNZ. *Naturwissenschaften* 8, 393 (1920).—The priority in the explanation of the deficit in the at. wt. by the theory of the lag of energy should be ascribed to Swinne, and not, as previously (*C. A.* 14, 3571) to Harkins and Wilson. J. C. S.

Crystallographical observations on atomic structure. HERMANN TERTSCH. *Sitzb. Akad. Wiss., Wien* 129, I, pp. 24.—The crystals even of the elements cannot, in general, be regarded as point lattices, since the individual components, the atoms, do not uniformly exhibit spherical symmetry, and also the symmetry of the components does not generally coincide with that of the lattice. The properties of Bohr's model do not indicate spherical symmetry of the atoms, although the discordance is not so marked if the path of the electrons is not regarded as lying in a plane. The cryst. forms of the several elements are compared with the object of elucidating regularities or detecting approximations in the individuals to spherical symmetry. The latter is found to be shown to a greater extent by the heavier than by the lighter elements. Special emphasis is laid on the possibility that the path of the electrons lies on the surface of a sphere, and the distribution of the electrons in such a system, and the type of symmetry which is thereby necessary for at. structure, are discussed. T. further examines the possibility of coincidence between the hypothetical distribution of electrons thus derived (at. symmetry) and the observed lattice symmetry. It is shown that a rational connection exists between at. symmetry and cryst. form. This is readily demonstrated for 23 of the 43 crystallographically known elements; for 4 others, a suitable arrangement of electrons can be given provisionally, while for the remaining 16 it is not at present possible to put forward a satisfactory hypothesis concerning the relationship of at. and cryst. forms without resorting to very problematical suppositions. J. C. S.

The scattering of X- and γ -rays by rings of electrons—a crucial test of the electron ring theory of atoms. G. A. SCHORR. *Proc. Roy. Soc. (London)* 96A, 395-423 (1920).—A mathematical paper, the object of which is to show that the scattering (*i. e.*, the redistribution in space without change of frequency of a portion of the incident radiation) of X- and γ -rays by matter affords a crucial test of the electron ring theory of atoms, and is one involving a minimum knowledge of at. structure. Thomson's theory of scattering is discussed briefly, its conflict with expt. pointed out, and S. in this paper attempts a thorough discussion of the subject including the case where the number of electrons in the ring becomes infinite while the mass remains finite—a condition which may be considered represented by the ring electron. ARTHUR COHEN

The collisions of α particles with hydrogen nuclei. C. G. DARWIN. Christ's College, Cambridge. *Phil. Mag.* 41, 486-510 (1921).—The exptl. work of Rutherford (*C. A.* 13, 2480) has been made the basis of a theoretical and mathematical treatment on the subject. A so-called "collision relation" is developed and applied to Ruther

ford's results. Various shapes and sizes of nuclei have been tested without getting any definite decision, though a rough measure of agreement was obtained with a nucleus of diameter 2.7×10^{-13} cm. A more accurate series of measurements is now being made in Rutherford's laboratory, and D. believes it will be better to leave the decision as to the shape and size of the nucleus until the more accurate data become available.

S. C. LIND

Rate of decay of actinium and the transformation relationships of the actinium series. STEFAN MEYER. *Wien. Anzeiger* 1920, 133.—The half-life period of Act is calcd. to be about $16\frac{1}{2}$ years, and the transformation ratio of the Act to the U-Ra family to be 4%. Also in *Sitzb. Akad. Wiss. Wien., Abt. IIa*, 129, 483-90. J. C. S.

The size of ions and the energy of the space lattice in the alkali halides for atom models with orbits of cubic symmetry. HUGO SCHWENDENWEIN. *Z. Physik* 4, 73-88(1921); Fajans and Hertzfeld (*C. A.* 15, 337) have calcd. the potential energy of these space lattices for a static cubic model. S., by means of Rella's formula (*C. A.* 15, 625), calcs. it for a cubic lattice of "Landé atoms" where the electrons revolve in 4 great circles on the surface of the sphere, one perpendicular to each of the 4 diagonals of a cube. By means of the known lattice consts. and the equation of equil. the radii of these spheres (ions) are calcd. The results do not agree with those of Landé (*C. A.* 14, 3571). The values of the total energy agree well with the thermal data. The compressibilities are too high.

F. C. HÖR

Cohesion forces of the diamond. HANS THIRRING. Vienna. *Z. Physik* 4, 1-25 (1921).—T. advances two hypotheses for the electron arrangement in the diamond space-lattice: (1) all the electrons belonging to a nucleus are confined within a sphere about it whose radius is small compared to the lattice spacing; (2) four of the electrons revolve in orbits that lie half way between nuclei, and two in orbits close to the nucleus. Calcn. of the potential of the lattice on the basis of (1) gives the heat of sublimation the wrong sign. (2) has been condemned by Debye and Scherrer (*C. A.* 13, 1415) because it would seem to indicate a strong second-order X-ray reflection which is not found, but Coster (*C. A.* 14, 2443) has shown that with certain very small values of the ring radii the scattering of the electrons would give the observed interference patterns. T. then calcs. the heat of sublimation on (2) as the difference in energy of the electron rings in free C where Landé's formula holds (*C. A.* 14, 3571) and in the lattice where he applies Bohr's azimuthal quantum condition to each ring independently. These results will fit approx. the value given by Kohn (*C. A.* 15, 782) if in the free state the quantum number is 2 and in the lattice it is 1. Thus T. concludes that (2) is correct, and believes that this is the general characteristic of homopolar binding, the intermediate electron rings forming the negative part of the lattice.

F. C. HÖR

Thermochemistry of ionization of vapors of certain compounds. PAUL D. FOOTE AND F. L. MOHLER. *J. Wash. Acad. Sci.* 10, 435-44(1920).—The possibility is discussed of computing, from chem. and phys. data, the ionization potential of a compd. in the vapor state when that compd. ionizes by dissociation. Thermochem. equations are used to derive a general expression for the work necessary to ionize a g. mol. of RX, where R is an alkali metal and X a halogen. In a similar manner, the ionization potentials of HgCl_2 and HgCl are calcd. The calcs. of Born and Fajans (*cf. C. A.* 14, 3581-2) on the ionization potentials of HCl , HBr and HI are reproduced. The authors conclude that the investigation of ionization potentials of vapors of compds. is important from the thermochem. standpoint.

ARTHUR COHEN

Influence of temperature upon electrical double refraction. NIKOLAUS LYON AND FRITZ WOLFRAM. *Ann. Physik* 63, 739-52(1920).—The Kerr effect, relating to change of velocity of light in a medium in an electric field, has been explained as due to the orientation of mols. (*cf. C. A.* 15, 983). There are 3 methods of testing this theory, 2

of which have been tried with affirmative results (cf. *C. A.* 9, 2031). The 3rd method depends upon the variation of the const. of Kerr with the temp. The const. may be calcd. by means of an equation developed from the hypothesis of mol. orientation, with the use of readily obtainable physical data. These calcd. values of the const. are compared with the values given by actual measurements. There is good agreement.

C. R. PARK

Impacts between atoms and free electrons. O. KLEIN AND S. ROSSELAND. Kopenhagen. *Z. Physik* 4, 46-51(1921).—Ionization measurements in vacuum tubes have indicated the occurrence of impacts between atoms and free electrons in which the electron loses energy and the atom changes from a stationary state of lesser energy to one of greater. K. and R. point out that if there is not to be a disturbance of the temp. equil. in contradiction to the second law, impacts must also occur in which the electrons gain energy and the atoms lose it. There is a brief statistical discussion. F. C. HOYT

A method of spectrum analysis by means of X-rays. MANNE SIEGBAHN, AXEL E. LINDH AND NILS STENSSON. Lund. *Z. Physik* 4, 61-7(1921).—The substance to be examd. is made the anticathode in an X-ray tube and the elements present are identified by their characteristic K or L radiation. The tube, which is of metal, has a helical filament giving a long focal spot, which sends the radiation through a narrow slit to a stationary crystal. The reflected beam can be photographed over a range of 40° on a circular film. The whole app. is evacuated and the tube water-cooled to carry 30 ma. All elements from Na to U can be identified in 2 exposures of 2 hrs. each, one with calcite (1 to 4.6 Å) and one with gypsum (2.6 to 11.6 Å.). F. C. HOYT

Characteristic absorption of X-rays. L series. WILLIAM DUANE AND R. A. PATTERSON. Harvard Univ. *Proc. Nat. Acad. Sci.* 6, 500-18(1920).—B. and P. measure by the ionization method the 3 absorption limits in the L-series X-ray spectrum of W, Pt, Au, Hg, Tl, Pb, Bi, Th and U. The results agree well with the measurements of Wagner (*C. A.* 9, 2033) and De Broglie (*C. A.* 12, 2066) but are more complete and accurate. F. C. HOYT

Relative position and intensities of lines in X-ray spectra. WILLIAM DUANE AND R. A. PATTERSON. Harvard Univ. *Proc. Nat. Acad. Sci.* 6, 518-27(1920).—D. and P. show by ionization graphs of emission lines and absorption limits measured at the same time that in the L-series of W the first absorption limit is of slightly longer wave length than the line Siegbahn calls β_1 , the second absorption limit is slightly longer than γ_1 and the third is just shorter than γ_4 . F. C. HOYT

The discovery of Röntgen rays twenty-five years ago. W. WEIN. Röntgen rays and therapy. MAX LEVY-DORN. The history of the development of Röntgen tubes. PAUL KNIPPING. In what ways are we justified in speaking of a microscopic delineation of minute structure by means of Röntgen rays? M. V. LAUE. Röntgen rays and crystallography. FRIEDRICH RINNE. The fundamentals of Röntgen ray spectroscopy. ERNST WAGNER. The significance of Röntgen rays in the study of atomic structure. W. KOSSEL. The gain to chemistry from the physical study of Röntgen rays. PAUL PFRIFFER. *Naturwissenschaften* 8, No. 50(1920).—The whole number of *Naturwissenschaften* for the 10th of December, 1920, is devoted to a symposium commemorating the 25th anniversary of the discovery of Röntgen rays. H. GAMB

Polarization and intensity of fluorescence in iodine vapor and its independence of temperature. PETER PRINGSHEIM. Berlin. *Z. Physik* 4, 52-60(1921).—P. shows experimentally that between 20 and 275° K. the % of polarization of the fluorescent light from I vapor excited by either polarized or unpolarized light is independent of temp. to within about 2%. The intensity of the fluorescence decreases relatively little with temp. and not at all in the proportion that would be expected if the decrease can be accounted for by shortening of the mean time of impact. (Cf. Stern and Volmer, *Physik Z.* 15, 317(1914)). F. C. HOYT

Rotation spectra and isotopes. ARTHUR HAAS. Vienna. *Z. Physik* 4, 68-72(1921).—H. points out that in the 3 kinds of rotation spectra, (pure rotation, rotation superposed on a vibration, and band spectra) the frequency of a line associated with a given quantum number is a function only of the mol. moment of inertia. This would serve to distinguish the spectra of isotopes. (Cf. Kratzer C. A. 15, 1254, who has calcd. similar effects in the spectrum of HCl for pure vibration of the mol.). The effect would be best evident in the rotation and vibration spectrum of Cl, where there would be a sepn. given by $\Delta\alpha = \alpha(\nu - \nu_0)$, where $\alpha = \mu/(2m + \mu)$. μ is the small whole number added to the at. wt. m , and ν_0 is the fundamental frequency on which the rotational effect is superposed. This would give a series of triplets for the 3 isotopes of Cl. In band spectra the sepn. can also be calcd. The available data do not serve to test this in either case. F. C. HORR

The vacuum spark spectra in the extreme ultra-violet of carbon, iron and nickel. R. A. MILLIKAN, I. S. BOWEN AND R. A. SAWYER. *Astrophys. J.* 53, 150-60(1921). Millikan, C. A. 14, 3193 and Sawyer, C. A. 15, 1101.—Spectroscopy of the extreme ultraviolet. A grating suitable for this region must be more accurately ruled than is necessary for work in the visible region, and as much light as possible must be thrown into the first order. These requirements were met by ruling with a light touch, leaving half the original surface between the lines. Best results were obtained by 500 to 1100 lines per mm. The method of deriving wave lengths is given in detail. The intensities and wave lengths, accurate to 0.2Å., of 75 lines due to C (λ360-λ1931), of 200 lines due to Fe (λ271-λ2153), and of 75 lines due to Ni (λ731-λ1860) are given in tables. K. BURNS

The variation with temperature of the electric-furnace spectrum of manganese. ARTHUR S. KING. *Astrophys. J.* 53, 133-143(1921).—The spectrum produced in the tube resistance furnace at 1700°, 2000°, and 2400° was examd. from λ2795 to λ8200, but no lines were found beyond λ6500. The relative intensities of the lines in the arc spectrum and in the furnace spectra at the different temps. are tabulated, and the temp. classification of the lines is given. Some lines were observed at 1560°; the triplet λ4031 to 4035 was strong and well reversed at this temp. As with other furnace spectra, the ultraviolet wave length limit is shorter the higher the temp. None of the enhanced lines of Lockyer occurs in the furnace. The behavior of various types of lines is given in detail. Of special interest is the triplet at λ2800 which is always reversed, and the one at λ4033 whose intensity depends on the quantity of vapor present. K. BURNS

Intensity differences in furnace and arc among the component series in band spectra. ARTHUR S. KING. *Astrophys. J.* 53, 161-4(1921).—Under high dispersion, the A₁ series of lines in the cyanogen band at λ3883 is enhanced over the A₂ series in the furnace as compared to their behavior in the arc. Some new doublets appeared in the furnace. The two series appear to belong to different temp. classe; and may be expected to differ in other characteristics. The cyanogen band at λ4216 showed similar differences between furnace and arc. In the Swan band at λ5165 the triplet series is enhanced in the furnace spectrum with reference to the adjacent doublet series. The bearing of these data on at. structure is pointed out. K. BURNS

High-speed radiography and radio-metallography (THORNE-BAKER, LEVY) 5. Determination of the uranium and thorium content of minerals (BORGERSTRÖM) 8. Color and chemical constitution (MORR) 10.

PERRIN, JEAN: *Die Atome*. 2nd Ed. Dresden and Leipzig: Th. Steinkopff. M. 9. For review see *Z. physik. Chem.* 97, 253(1921).

TRAUT, H.: *Lehrbuch der Röntgenographie*. Revized by Herm. Engelken. Halle a.S.: Wilhelm Knapp. M. 13.50, bound M. 16.50. For review see *Phot. Rundschau* 57, 55(1921).

4—ELECTROCHEMISTRY

COLIN G. FINK

Manufacture of ferromanganese in the electric furnace. ROBERT M. KEENEY AND JAY LONERGAN. *Trans. Am. Inst. Mining and Met.* Preprint. No. 1057. 36 pp. (1921).—A complete survey of the elec. Fe-Mn industry in the U. S. proves it to be the result of war demand. At present prices it can just about compete with the blast furnace, owing to a 50% coke saving and the practicability of small units at the source of ore supply. The recovery and losses are approx. the same for each. With high-grade Mn ore the lack of Fe is made up with Fe ore rather than with turnings. CaCO_3 proved a more satisfactory flux than CaO. A theoretical charge calcn. may be used for starting up, but then materials are varied as experience shows best. Among the difficulties of furnace operation are: (1) formation of carbide—best prevented by use of lignite and less CaCO_3 , together with intermittent charging; (2) "blowing"—minimized by charging fully after tapping; (3) failure of bottoms—reported only with C brick and faulty operation; magnesite is theoretically best and has proved entirely satisfactory; (4) failure of electrode holder—corrected by a proper design; (5) bridging of charge—avoided by closer electrode spacing (3 1/2 ft. between centers). Cleaner slag and metal result from tapping into pots. Considerable metallurgical and operating data are given in detail. The 74% Fe-Mn was made with 4457 kw.-hrs. and 180 lbs. of electrode, per ton. The av. load factor was 82%, and the cost (minus overhead) averaged \$176 per ton, but this can be much reduced by recent improvements. F. H. HOTCHKISS.

Decreasing electrode consumption in electric furnace. ANON. *Elec. World* 77, 776(1921).—Wasteful oxidation occurring under the furnace roof is known as "spindling" while that only near it is known as "wasping." "Spindling" is due to evolution of oxidizing gases from the charge or to a leaky furnace door and is reduced by: covering the electrode with non-burning paint, surrounding the electrode with steel collars held together with springs or hinges, or surrounding the electrode with a water-cooled collar. Luting the clearance between the roof glands and the electrodes with fireclay, and placing a large piece of soft coal on the sill of each furnace before closing, tend to reduce oxidation upon stopping of furnace operation. "Wasping" is caused by excessive heating of the electrode above the roof and is almost impossible of correction, necessitating replacement.

W. H. BOYNTON

Causes of the periodic phenomena in the electrolysis of chromic acid and the deposition of metallic chromium. ERIC LIEBREICH. Univ. Berlin. *Z. Elektrochem.* 27, 94-110(1921).—The electrolysis of aq. solns. of H_2CrO_4 between Pt electrodes has been investigated at 20°. It has been found that the decompn. voltage curve consists of a system of 4 curves which lie close to one another and which run together at low c. d.'s and voltage; and that at certain c. d.'s the voltage passes abruptly from one curve to another. The periodic phenomena observed during the electrolysis of H_2CrO_4 are due to the repetition of these abrupt voltage changes. Each of the curves which branches off from the main curve is a deposition curve of a definite Cr compd. The curve lying nearest to the voltage and farthest from the c. d. coordinate is the deposition curve of metallic Cr. The periodic phenomena in the electrolysis of H_2CrO_4 are manifested when there occurs an alternate reduction and re-oxidation of the deposited product; they are not passivity phenomena. It has not been found possible to deposit metallic Cr with c. d.'s above 0.45 amp./cm². The deposits of Cr obtained with small c. d.'s have a bright metallic appearance and, in contradistinction to those formed at higher c. d.'s adhere with great tenacity.

H. JERMAIN CREIGHTON

The question of the cathodic reduction of dissolved elementary nitrogen. ERICH TYNDE AND ARTHUR SCHLEEDÉ. Univ. Berlin. *Z. Elektrochem.* 27, 112-4(1921).—Although many attempts have been made under varying conditions to reduce, cathod-

ically, N dissolved in an electrolyte, no evidence of the formation of NH_3 has been obtained.

H. JERMAIN CREIGHTON

The lead storage battery in industrial plants. ALFONS LANGER. *Chem. Ztg.* **44**, 749-50(1920).—Notes are given on the performance of a 12-year-old, 100-amp., 220-v. battery. Some rough expts. on the temp. changes on charging and discharging were made and found to be only 1° to 2° in the open station type battery. The battery room should be maintained at from 12° to 17° for best results.

M. KNOBEL

Test chart for use in battery-charging stations. ANON. *Elec. Rev.* (Chicago) **78**, 694(1921).—A logical diagrammatic arrangement of symptoms is shown which makes it easy to locate quickly almost any type of battery trouble.

C. G. F.

Dry batteries. F. KAINZ. *Chem. Ztg.* **45**, 51-2(1921).—An elementary description of the small 3-cell dry-battery for pocket flash lights.

M. KNOBEL

Cottrell process of electrical precipitation. ANON. *Mining Sci. Press* **122**, 495-500(1921).—A historical account is given of the early English and German expts. and unsuccessful com. attempts at electrical pptn. The Cottrell process is described. The various types of precipitators are described, together with details of their construction, and description of elec. equipment required. In designing a plant, the compn. and elec. cond. of the gases, the nature of the suspended particles, the temp. and gas vol. must be considered. A list of applications of the process is given together with a very complete bibliography.

A. H. HELLER

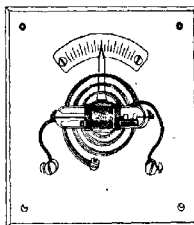
New thermostatic switch for electric circuit. ANON. *Elec. Rev.* (Chicago) **78**, 676(1921).—This is a new device for making and breaking an elec. circuit. To a double spiral of thermostatic metal the contactor tube is attached at the center in a horizontal position, in such a manner, that the opening or closing of the spiral due to temp. changes serves to tilt the contactor tube one way or the other. The contactor consists of a glass tube, hermetically sealed and containing a definite amt. of Hg and an inert gas. Owing to the inert gas no oxidation of the Hg takes place from the arc produced from making or breaking contact. When the spiral tilts the tube downward, the Hg engages both tips of the electrodes, establishing the circuit. Temp. variations as small as 1° may be taken care of. The device can be adjusted to operate at any temp. at which Hg is liquid. For small currents it can be connected directly into the line.

C. G. F.

For higher currents, it is used as a relay.

Manually operated alternating current controllers. G. J. KIRKGASSER AND E. W. SENGGER. *Elec. Rev.* (Chicago) **78**, 653-6(1921).—An illus. account of modern app.

C. G. F.



Properties of resistor materials used for heating purposes (SWOBODA) 9. Removal of arsenic from zinc electrolyte (HANLEY) 18. Impulsive sparking voltages in small gaps (MORGAN) 2. Apparatus for electrical precipitation of suspended particles from gases (U. S. pat. 1,371,995) 21.

Elektrische Schwachstromanlagen für die Chemische industrie. Berlin: Siemens & Halske A. G. 40 pp. For review see *Chem. Weekblad* **18**, 41(1921).

MOISSAN, HENRI: *The Electric Furnace*. 2nd Ed. Translated by Victor Lehner. San Francisco: *Mining Sci. Press*. 308 pp. \$3.50. For review see *Mining Sci. Press* **122**, 609(1921).

RALSTON, OLIVER C.: *Electrolytic Deposition and Hydrometallurgy of Zinc*. New York: McGraw-Hill Book Co. 201 pp. \$3. For review see *Eng. Mining J.* **111**, 634(1921).

Audions. M. SARGI AND K. KOYAMA. Japan, 35,935, March 9, 1920. The anode is made of metallic gauze or consists of a perforated metal plate bent into the form of a tetrahedron. Inside of the anode is the filament. A glass tetrahedron wrapped with wire in helical form may be used in place of the plate without detriment to the vacuum.

Battery plate. R. ONO. Japan, 36,034, March 25, 1920. Short Pb tubes are fitted vertically to the battery plate of grid-form and the grid filled with active materials.

Storage battery. C. J. V. FERRY. U. S. 1,371,746, March 15. Structural features.

Storage battery. E. F. ANDREAE. U. S. 1,371,661, Mar. 15. Structural features.

Storage battery. W. L. GILL. U. S. 1,371,998, Mar. 15. Structural features.

Storage batteries. W. E. HOLLAND. U. S. 1,371,894-5, Mar. 15. Structural features.

Storage batteries. W. E. HOLLAND and J. M. SKINNER. U. S. 1,371,092-3, Mar. 8. Structural features.

Storage batteries. JAS. BALZANO. Can. 210,508, Apr. 19, 1921. A storage battery has a positive and a negative series of plates, charging connections at the top and discharging connections at the bottom.

Storage batteries. DRAN W. DAVIS. Can. 210,277, Apr. 12, 1921. Fixed porous partitions form a series of isolated compartments in the container. An electrode is placed in each compartment, alternate electrodes being positive. There is loose material in each compartment and an electrolyte common to all compartments.

Storage batteries. JNO. N. LYON. Can. 210,329, Apr. 12, 1921. Paste for storage batteries contains as its basic substance suboxide of Pb partly or completely carbonated.

Storage batteries. A. H. SNYDER. Can. 210,377, Apr. 12, 1921.

Storage batteries. A. H. SNYDER. Can. 210,379, Apr. 12, 1921.

Storage batteries. A. H. SNYDER. Can. 210,378, Apr. 12, 1921.

Storage batteries. WALTER L. GILL. Can. 210,294, Apr. 12, 1921. A battery comprises a jar, alternating positive and negative plates, connecting straps for the plates, and an upper spacing element lying between and beneath the straps and having depending portions which lie between the plates.

Storage batteries. W. S. GOULD. Can. 210,301, Apr. 12, 1921.

Storage batteries. W. S. GOULD. Can. 210,300, Apr. 12, 1921.

Electrode for storage cells. ROBERT AMELN and CARL O. J. MONTHLIUS. Can. 210,785, Apr. 19, 1921. The electrode comprises a number of flattened perforated receptacles placed together with the flattened sides facing each other in planes perpendicular to the sides of the electrode.

Electrodes for storage batteries. JAS. M. ALLEN. Can. 210,506, Apr. 19, 1921.

Separator for storage batteries. WALTER L. GILL. Can. 210,293, Apr. 12, 1921. A separator for storage battery plates of inverted U shape has a pair of legs and a transverse connecting head, the latter having a vertical slot.

Primary galvanic batteries with unalterable electrolyte. E. W. JUNONER. Can. 210,908, Apr. 23, 1921.—The positive electrode of a primary cell is porous and on one surface, exposed to the air, has a substance capable of depolarization by the action of the O of the air. The electrolyte is unvarying. The negative metal electrode is capable, during the operation of the cell, of being transformed into a hydrate insol. in the electrolyte.

Electrolyte for storage batteries. WM. GARDINER. Can. 210,470, Apr. 12, 1921. An electrolyte for storage batteries contains, H_2SO_4 , a silicate and powdered soapstone; plaster of Paris also may be added.

Paste for storage-battery plates. T. A. WILLARD. Brit. 155,944, Oct. 17, 1919. Paste for storage-battery plates contains a small quantity, not exceeding 1%, of wood

dust. Six-tenths of 1% is preferably used, and the dust may be of oak or other wood in its natural state. The active material may consist of red lead and litharge. The paste is for use particularly in batteries employing separators made of a material other than wood.

Means for sealing terminal posts in storage-battery covers. FRED W. BARHOFF. Can. 210,432, Apr. 12, 1921.

Dry cells. CARL HAMBURCHEN. Can. 211,020, Apr. 26, 1921. In dry cells the negative element is left unwrapped and is provided with protecting caps fitted over each end to prevent disengagement of particles and to space the element from the container electrode.

Dry cells. HARRY F. FRENCH and RAYMOND C. BENNER. Can. 211,021, Apr. 26, 1921. Paste coatings are formed on the zincs of dry cells by applying a coating of vegetable paste to the can, inverting the can to prevent the collection of excess paste at the bottom and cooking the paste while the cell is in the inverted position.

Electric batteries. RAYMOND C. BENNER and HARRY F. FRENCH. Can. 210,416, Apr. 12, 1921. Elec. batteries with alk. electrolytes have negative elements contg. an oxide of Pb and S intimately mixed therewith.

Electric batteries. R. C. BENNER and H. F. FRENCH. Can. 211,017, Apr. 26, 1921. In making dry cells a mix is molded around a carbon electrode to form a cartridge, paste is applied to the inside of a Zn can, the cartridge is inserted in the can and the paste cooked to form an adherent layer in the inner surface of the can.

Electric batteries. NEWCOMB K. CHANEY. Can. 210,415, Apr. 12, 1921. A mixt. for dry cells contains C free from sol. sulfides. Such impurities may be removed with HCl to produce a sol. chlorides or with an agent which will produce insol. harmless hydroxide.

Electric batteries. HARRY F. FRENCH. Can. 211,016, Apr. 26, 1921. A sheath for the electrodes of batteries consists of two strips of bibulous material secured together at three of their edges and a layer of flour paste on the inside surfaces of both sheets. The electrode may thus be inserted into the sheath when the battery is to be made active.

Electric battery. HARRY D. BATCHELOR. Can. 211,022, Apr. 26, 1921. A cartridge containing the electrolyte for dry cells is covered with a removable wrapper, which is coated with a celluloid cement adapted to retain the electrolyte and water-proof the wrapper.

Electric batteries. HARRY F. FRENCH. Can. 211,018, Apr. 26, 1921. To a battery having electrolytes which tend to become progressively more alk. during the life of the battery an org. substance is added to reduce the rate at which such alkalinity develops. The following substance may be used: CCl_4 , $\text{C}_2\text{H}_5\text{Cl}$, $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$, $\text{C}_2\text{H}_5\text{NH}_2$, HCl . Cf. C. A. 15, 347.

Electrode terminal for electric batteries. H. M. KOWETZKY. U. S. 1,371,907, Mar. 15. Structural features.

Sea water batteries for vessels. ARTHUR BRIDGE. Can. 210,847, Apr. 26, 1921. In a cell which contains electrolyte there are coating negative and positive plates. One plate is vertically disposed and tapers downward; the other plates are arranged on each side of the first and extend upward and outward parallel to the side faces of the first plate so that this can feed downward by gravity between the other plates. Means for lifting the first plate and means for circulating salt water through the cell are provided.

Battery grids. FRANKLIN R. BICKHART. Can. 210,438, Apr. 12, 1921. A grid comprises a frame and opposite sets of spaced parallel ribs, said ribs forming opposite sets of rectangles. The rectangles of one set are arranged in staggered relation to those of the opposite set.

Battery-cell cover. REGINALD M. JONES. Can. 210,095, Apr. 5, 1921. The cover has a pair of rectangular end sections having laterally extending flanges, an intermediate section engaging the flanges of the end sections and fitting between them and a sealing material placed between and around the sections.

Electrolyte for batteries. A. A. BREITENWISCHER and G. A. HOWLAND. U. S. 1,371,466, Mar. 15. An electrolyte mixt. for use in ignition batteries is formed of plaster of Paris 1 lb., PbO 4 oz., glacial HOAc 1 oz., snake oil 1 oz., C dust 1 oz., H₂SO₄ 1 pint, CuSO₄ 1 oz., NH₄Cl 1 oz., lemon oil 1 oz., Pb₂O₄ 4 oz., ground glass 3.5 oz., Fe dust 8 oz. and H₂O 8 oz.

Electrolytic recovery of metals. ERNEST MOULTON. Can. 210,117, Apr. 5, 1921. The terminals of an elec. circuit are immersed, resp., in an acid soln. and in an alkaline soln. of the metal to be extd. and an elec. current is passed through the terminals. The method is particularly applicable to the treatment of low-grade Zn ores. The Zn formed by decompn. in the anode chamber migrates to the cathode chamber through the sepp. diaphragm and in the latter chamber forms zincate, from which it is deposited on the cathode.

Electrolytic recovery of zinc. ELECTROLYTIC ZINC CO. OF AUSTRALASIA PROPRIETARY. Brit. 155,792, Apr. 29, 1920. Cl is removed from Zn solns. before electrodeposition of the Zn. A sol. Ag salt may be used for this purpose. Corrosion of the electrodes, which usually consist of a leaden anode and an Al cathode, is thus prevented. When the electrolyte contains glue, and the anode is coated with MnO₂, the Cl need not be reduced below 50 mg. per l., but otherwise its removal should be as complete as possible. In a cyclic process where roasted ore is treated with spent electrolyte containing H₂SO₄, a part of the liquid is withdrawn, preferably after Zn-dust purification, and slightly acidified by H₂SO₄. Finely powdered Ag₂SO₄ is added, preferably in quantity sufficient to ppt. all the Cl except 2-3 mg. per l. After agitation of the mixt. for about an hr. more of the Zn soln. is added so as to render the liquid neutral or slightly alk., and agitation may be continued so as to assist the resulting coagulation of the AgCl, which is then allowed to settle. The supernatant liquid is passed through a filter-press, preferably of wood, and of the chamber type, treated with a little Zn dust to remove any traces of Ag, again filtered, and passed on to the depositing vats. Several charges can be similarly treated in the pptn. vat. The AgCl thus collected is mixed with the residual soln. and pumped to a small tank in which is also placed the chloride from the filter press. H₂SO₄ and Zn dust are added in proportions such that all the AgCl is reduced to metallic Ag and then an excess of acid is present so as to dissolve all the Zn, the mixt. being agitated. The ppt. is tested for unreduced Cl by treatment with NH₃, filtration, and addition of HNO₃. After completion of the reaction, the mixt. is removed to a flat-bottomed filter and the soln. removed by a vacuum pump. The Ag is dried and heated in a pan with the calcd. amt. of H₂SO₄ to 250-300°, with stirring which is more frequent towards the end so that the sulfate is obtained as a granular mass. This is ground in a mill with flint pebbles, for re-use in the process.

Electrolytic recovery of zinc chloride from solutions obtained in washing vulcanized fiber. O. LINDER. U. S. 1,371,698, Mar. 15. ZnCl₂ is recovered from solns. obtained in washing vulcanized fiber by electrolyzing with a Zn anode and Zn cathode, the anode being surrounded by a ZnCl₂ soln. enclosed in a porous cup or sepd. from the cathode electrolyte by a porous diaphragm. Zn is pptd. at the cathode and Cl liberated at the anode. The electrolyte is prevented from becoming acid and O and H are not liberated. If a C anode is used instead of the Zn anode there will be some liberation of Cl and O at the anode and some formation of HCl adjacent to the cathode. By using both a Zn and a C anode, either in the same electrolyte or sepd. by a porous cup or partition, the electrolyte surrounding the cathode may be maintained acid, alk. or neutral at will. The separators between the electrodes may be formed of unglazed

porcelain, skin, leather, hardened gelatin, coagulated albumin, pig bladder, fiber, paper or viscose. Other electrolytic processes may be similarly carried out with anodes of different materials.

Separating cobalt from zinc solutions. H. W. GERRE. Can. 210,182, Apr. 5, 1921. Co is sepd. from Zn solns. for electrodeposition of the Zn by pptn. with PbO in the presence of a Mn compd.

Electrodeposition of copper from ore solutions. G. D. VAN ARSDALE and C. G. MAIER. U. S. 1,371,826, Mar. 15. Cu ore is leached with a soln. containing H_2SO_4 , $Fe_2(SO_4)_3$ and $MnSO_4$. The soln. is electrolyzed to deposit Cu at the cathode and form MnO_2 at the anode, which oxidizes ferrous Fe compds. in the soln. Addition of $CuSO_4$ to solns. obtained from Mn ore facilitates electrolysis of the soln. at lower voltages than otherwise would be required without evolution of H_2 at the cathode, metals acting as mutual depolarizers.

Calcium cyanamide. L. E. FRIDRICH. U. S. 1,371,616, Mar. 15. In the manuf. of $CaCN_2$, a charge of powdered CaC_2 in layer form is moved through a furnace and heated from the top down while being treated with a countercurrent of N, at such a rate that as soon as the upper layer of the charge has been converted into $CaCN_2$ it will have reached a cooler portion of the furnace. The reaction then proceeds exothermically down through the underlying portions of the charge.

Diols; diolefins. H. PLAUSON and J. A. VIELLE. Brit. 156,145, Dec. 31, 1920. Diols are prep'd. by the electrolysis in acid soln. of a mixt. of aliphatic aldehydes and ketones in molecular proportions, whereby a simultaneous condensation and reduction takes place. The same result is obtained by electrolyzing the condensation product of the aldehyde and ketone, *e. g.*, ketobutanol or hydroacetylacetone. The mixt. is electrolyzed in a cell having an amalgamated cathode of Mg, Al, Pb, or alloys thereof, and with an anode sepd. by a diaphragm; or in the cathode space of a Hg cell without a diaphragm; or by the use of the filter electrode described in 155,835.

Acetaldehyde; acetic acid. H. PLAUSON and J. A. VIELLE. Brit. 156,147, Dec. 31, 1920. AcH or HOAc is prep'd. by forcing C_2H_2 through a conductive porous anode, such as is described in 155,835, the pores of which are filled with an insol. Hg compd. The electrolytic bath being acidic, the Hg compd. is continuously regenerated by anodic oxidation. The bath is maintained at such a temp. that the product is continuously dist'd. off, and the pressure may be reduced to facilitate the distn. If the potential difference between the electrodes be maintained below the decompn. potential of H_2O , the AcH produced is immediately oxidized to HOAc. A suitable electrolyte is H_3PO_4 , and the anode may be formed of wire netting, or perforated or corrugated sheets made of Fe, steel, Ni, Ni steel, ferrosilicon, Fe-Ni or Fe-Al alloys, or Cu coated with Pt or Au. The Hg compd. *e. g.*, mercurous oxide or Hg phosphate, may be employed as such or mixed with oxides, peroxides, or porous fibrous substances such as asbestos, paper, thread, wool, or cellulose ester powder, with or without binding agents. An app. is described.

Electroplating with nickel. T. A. EDISON. U. S. 1,371,414, Mar. 15. In electroplating with $NiSO_4$ soln. as electrolyte, soln. is continuously withdrawn from the bath, treated with $Ni(OH)_2$ in order to regenerate $NiSO_4$ and returned to the bath.

Electric induction furnace adapted for melting brass. W. R. CLARK. U. S. 1,370,632, Mar. 8.

Tilting electric furnace. R. D. NYR. U. S. 1,370,989, Mar. 8.

Tungsten. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 155,851, Apr. 17, 1917. W, particularly for use as drawn wire filaments or supports in elec. lamps, is made by adding a soln. containing a silicate, a tantalate, a columbate, or a mixt. of such a soln. with boric acid, or boric acid alone, to an alkali-metal tungstate or its soln., drying and igniting the ppt., and reducing it to metal. The added material is removed with

impurities by volatilization during the subsequent treatment of the metal. In an example, a soln. of a fusion of silicic acid, K_2CO_3 , and $NaNO_3$ is added to a soln. of a fusion of tungstic acid, Na and K carbonates, and $NaNO_3$, boiled with steam, poured into boiling HCl and filtered, and the ppt. is dried, ignited, and reduced in H. The metal so produced may be pressed and sintered; or it may be mixed with an equal wt. of the oxide from which it was reduced, and the mixt. reduced as before. In other modifications, a soln. of a fusion of silicic acid, K_2CO_3 , and $NaNO_3$ may be added to a fusion of tungstic acid, Na and K carbonates, and $NaNO_3$; or the tungsten oxide referred to above may be mixed with a soln. of B_2O_3 , dried, ignited and reduced. In the prepn. of a lamp filament, the wire is given a preliminary heat-treatment or aging. The provisional specification refers also to the application of the process to the manuf. of metals generally. Cf. 207, 1908, 23,499, 1909, 9,941, 1912, (C. A. 7, 3458) 27,442, 1912, 3525, 1913, 10,918, 1913, and 15,961, 1914 (C. A. 10, 20).

Apparatus for determination of the insulating properties of oil. L. M. KLAUBER. U. S. 1,371,378, Mar. 15. The device is adapted for testing oil with a high-potential elec. current, in order to det. its insulating properties.

5—PHOTOGRAPHY

LOUIS DERR

Results of recent investigations on the theory of development. A. H. NIEZ. *Phot. J.* 60, 280-93(1920).—The effect of bromide upon a developer of low reduction potential is relatively greater than upon one of high potential; but this does not include the effect of bromide upon fog, which may be important practically. Max. density tends to increase with increasing potential, but max. contrast is not correlated with reduction potential. No definite relation can be shown to exist between time of image appearance and reduction potential. The fogging power of a developer is not a function of its reduction potential, nor is the speed of an emulsion, though this may vary with the developer used. In obtaining high contrast by prolonged development, bromide is desirable to prevent fog, and under these conditions a higher effective plate speed can be secured from a high-potential developer with bromide. As to the effect of mol. structure of the developer upon its reduction potential, aminophenols are the most energetic, hydroxyphenols next, amines last. Introducing a single methyl group in the nucleus or in the amino group raises the energy, but two methyl groups are not always more effective than one. Nuclear substitution of a halogen in the hydroxy-phenols raises the energy. In nuclear methylation (one CH_3 group) the energy is raised, but the increase depends on the position of the group. Introduction of another amino group greatly increases the energy. Chlorination of *p*-aminophenol appears of doubtful advantage. Simultaneous nuclear and side-chain methylation appears to give greater energy than either separately. Change to a glycine lowers the potential. Fog is found to continue to a definite limit or equil. density, and the growth of fog and image do not follow the same law. Fog is restrained more by bromide than the image is, indicating that most fogging agents are of relatively low reduction potential.

L. DERR

Some new directions for photographic research. J. RHEINBERG. *Phot. J.* 61, 120-6(1921).—The physical properties of colloid films and their utilization are suggested as a promising field.

L. DERR

Causes of the variation in reducing power found in various samples of commercial ammonium persulfate. A. AND L. LUMIERE AND A. SEYEWETZ. *Phot. J.* 61, 144(1921).—All samples of commercial persulfate tested by the authors, if dissolved in distd. water and acidified to 0.25-0.5% of the soln. with H_2SO_4 , exhibit the characteristic re-

ducing properties of the salt normally. Traces of ferric salts are unnecessary; but a little free H_2SO_4 is essential, though too much is destructive. Neutral or alk. solns. have no effect. Traces of thiosulfate or halides completely inhibit the reducing action, and in large quantities bleach or halogenize the image. Sulfates or nitrates have no retarding effect. Also in *Brit. J. Phot.* 68, 124-5(1921). L. DERR

Action of light on the photographic plate. II. G. I. HIGSON. *Phot. J.* 61, 144-52 (1921); cf. *C. A.* 15, 808.—Photochemical studies of the AgBr grain have given rational explanations of the existence of a characteristic curve, the constancy of inertia, the Schwarzschild effect, and the hooked form of the exposure-density curve. The length of the intercept on the exposure-axis of the hooked form of curve is suggested as a measure of the plate speed under high-speed conditions. The analysis is largely mathematical. L. DERR

Action of light on the photographic plate and photochemical law of the silver halide grain. L. SILBERSTEIN AND S. E. SHEPPARD. *Phot. J.* 61, 205-6(1921).—The assumptions in both the mathematical and experimental work noted in the preceding abstract are criticized. L. DERR

High-speed radiography and radio-metallography. T. THORNE-BAKER AND L. A. LEVY. *Phot. J.* 61, 158-68(1921).—A new X-ray plate carries an emulsion of almost pure AgBr in specially treated gelatin, which will withstand several hours' immersion in water at 45°. Upon this is coated a layer of CaWO_4 in very soft gelatin which melts at 35°. During the exposure the CaWO_4 fluoresces blue-violet and ultra-violet, exactly matching the sensitiveness maxima of the AgBr in contact with it. In warm water the soft gelatin melts away and the plate is developed as an ordinary X-ray plate; the CaWO_4 is recoverable. The exposure required is from one-fifteenth to one-fortieth as long as for an untreated plate without intensifying screen. L. DERR

Orientation of the grains in a dried photographic emulsion. L. SILBERSTEIN. *J. Optical Soc. Am.* 5, 171-7(1921).—When a freshly coated emulsion dries the flat AgBr grains change their inclination to the plane of the film base; and both theory and observation show that about 94% of the grains have their inclination between 0° and 45°, and the remaining 6% between 45° and 90°. L. DERR

Size frequency distribution of particles of silver halide in photographic emulsions and its relation to sensitometric characteristics. I. E. P. WIGHTMAN AND S. E. SHEPPARD. *J. Phys. Chem.* 25, 181-95(1921).—Comm. No. 106, Research Lab. Eastman Kodak Co. The work of Slade and Higson, Ross, Svedberg, and others is briefly reviewed. There appears to be insufficient evidence for the assumption that the developed Ag grain has twice the diam. of the undeveloped AgBr grain. Equality of size seems more probable. L. DERR

Present methods of toning in various colors for photographic papers employing silver salts. A. SEYEWITZ. *Chimie & industrie* 5, 3-10(1921); cf. *C. A.* 15, 33.—Various methods are summarized: Au and Pt toning of printing-out papers, toning in brown, red, purple, and green with metallic salts on developing papers, direct and indirect S toning, toning with basic dyes after converting the image into AgI, and toning with quinone and KBr. Most of the methods have been reviewed in *C. A.* L. DERR

LIESEGGANG, F. PAUL: *Wissenschaftliche kinematographie*. With the assistance of K. KIRSER AND O. POLDMANTI. Düsseldorf: Verlag F. P. Liesegang. 352 pp. M48 + 20% Teuerungszuschlag. For review see *Chem. Ztg.* 45, 275(1921).

LÜPPO-CRAMER: *Negativ-Entwicklung bei hellem lichte (Safraninverfahren)*. Leipzig: Ed. Liesegang's Verlag. M. Eger. 86 pp. M10, bound M13. For review see *Phot. Rundschau* 57, 54(1921).

Photography. F. UHLMANN GES. Brit. 156,691, Jan. 7, 1920. In the production of dyed dichromated colloid negatives from opaque originals, in order to obviate a loss of sharpness when the developed negative is dyed, and to render it waterproof, the negative is dyed and then bathed in a soln. which will convert the dye into a water-insol. compd.

Photography. F. UHLMANN GES. Brit. 156,692, Jan. 7, 1921. To obtain negatives or transparencies which can be used either for offset printing methods or for making ordinary lithographic or rotary Zn printing surfaces a dichromated colloid negative is made on a surface from which it can be stripped and before stripping is coated with a gelatin soln. forming an upper film. To produce the dichromated films two glass plates are secured together and coated at the edges with a rubber film margin or border. The combined plates are dipped into a soln. of wax in CCl_4 to obtain a thin wax film, and after drying into a 3% collodion bath containing a few drops of castor oil. The plates are sep'd., coated very thinly with dichromated colloid, and after exposure and drying the additional gelatin is applied. The negatives may be retouched before stripping.

Photographic film. P. C. SEEL, H. COMBS and R. KEMP. U. S. 1,370,922, Mar. 8. Flexible photographic films are formed of a backing of nitrocellulose compn. containing castor oil and butyl or amyl alcs., carrying a light-sensitive Ag halide emulsion and an intervening cementing layer of gelatin and a solvent of nitrocellulose.

Photographic developer. A. S. McDANIEL and A. H. NIETZ. U. S. 1,370,896, Mar. 8. An alk. soln. containing diaminophenolsulfonic acid is employed as a photographic developer. The soln. may, e. g., be formed of diaminophenolsulfonic acid 40, Na_2SO_3 100, Na_2CO_3 30, KBr 4 and H_2O 1000 parts.

Photographic stencils. D. GESTETNER. U. S. 1,371,157, Mar. 8. A sheet of Yoshino or similar paper mounted on a temporary support or carrier and coated with a light-sensitive compn. is exposed to light to form, upon subsequent development, an image of matter to be reproduced and solubilized portions of the material thus formed are removed from the sheet to form a stencil.

Photomechanical printing. E. SAUER. Brit. 156,420, Jan. 30, 1920. To make an intaglio printing surface, a dichromated gelatin film on a thin transparent base is exposed from the front to a screen plate having transparent lines and opaque dots, and a diapositive of the picture is printed through the transparent base from the back. After development, the screen lines printed on the gelatin film will be on the same level and the thickness of the lines will decrease in the depth of the film, thereby forming intaglio hollows which are wider in the depth of the film than at the surface and forming a better holding for the ink. Also the lines or walls do not fall together when the plate is washed. To enable the gelatin film to withstand the actions of the roller, it is moistened with HOAc and coated with a film of zapon varnish.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Displacement of metals in salt solutions. BARLOT. *Compt. rend.* 172, 378-81 (1921).—Photographs are shown of the figures obtained when a piece of the displacing metal is placed on a piece of filter paper moistened with a soln. of a salt of the metal to be displaced. Elec. forces are believed to play an important part in the production of the branching metallic figures. D. MACRAE

Reactions for the preparation of magnesium. CAMILLE MATIONON. *Compt. rend.* 172, 381-3 (1921).—The following reactions are discussed: $\text{MgCl}_2 + \text{CaC}_2 = 2\text{C} + \text{CaCl}_2 + \text{Mg} + 22.4 \text{ Cal.}$; $\text{MgO} + \text{CaC}_2 = \text{CaO} + 2\text{C} + \text{Mg} - 8.4 \text{ Cal.}$; $\text{MgOMgCl}_2 + 2\text{CaC}_2 = \text{CaOCaCl}_2 + 4\text{C} + 2\text{Mg} + 1.1 \text{ Cal.}$ In carrying out the last 2 reactions the temp. should not be high enough to allow the formation of CaC_2 from CaO and C . The

first reaction proceeds sufficiently rapidly at 1200°. The two others give a good yield of metal but more slowly between 1200 and 1300°. The 2 last reactions avoid the prepn. of anhydrous $MgCl_2$, a delicate and costly industrial operation. In the second MgO may be replaced by a mixt. of CaO and MgO obtained by calcining dolomite.

D. MACRAE

Identity of Trechmann's "β tin" with stannous sulfide. L. J. SPENCER. *Mineralog. Mag.* 19, 113-23(1921).—Re-examn. of the original crystals from Cornish Sn furnaces establishes the identity of Trechmann's "β-tin" with SnS . The original error was due to failure to perform a chem. analysis on the same crystals that were studied crystallographically. In the smelting of pyrite-bearing Sn ores of Bolivia, some of the S combines with Sn forming platy crystals of SnS , while the Fe unites with Sn forming acicular crystals of $FeSn$. The crystals of SnS are orthorhombic and measure 2×3 cm. across but only $1/20$ mm. thick. They are opaque, iron-black in color and mark paper. $H=2$. The forms (010), (110), (120), (111), and repeated twinning on (101) were noted. Sp gr. varied, owing to impurities, from 5.52 to 6.45. $FeSn$ is tetragonal and forms aggregates of matted, acicular crystals. They are tin-white with metallic luster, often with iridescent tarnish, and sometimes black. Forms suggesting (100) and (110) were observed. $H = 3\frac{1}{2}$; non-magnetic; sp. gr. 7.77. W. F. HUNN

Reduction by metals in acid solutions. I. The reduction of acid ferric sulfate solutions by zinc and magnesium. SAMUEL SUGDEN. Birkbeck Coll. London. *J. Chem. Soc.* 119, 233-8(1921).—The reducing action of Zn and of Mg on $Fe_2(SO_4)_3$ in aq. solns. of H_2SO_4 has been studied at room temp. With Mg, it has been found that the percentage reduction increases with the Fe_2O_3 concn. and decreases as the SO_4 concn. increases. With Zn, the percentage reduction likewise increases with the Fe_2O_3 , and decreases as the SO_4 concn. increases at lower Fe_2O_3 concns. Above a certain minimum Fe_2O_3 concn., with increase in the SO_4 concn. the reduction at first decreases, reaches a minimum and then increases. A new type of reaction appears to set in; the Zn becomes dull gray, and dissolves much more slowly with scarcely any perceptible evolution of H. This peculiar behavior is most marked in solns. having a high Fe_2O_3 concn. The time required for the Zn to dissolve varies considerably. Thus, the Zn which dissolved in 1 hr. in a soln. containing 0.80 mol. Fe_2O_3 per l. and slightly less acid than required for the neutral salt, did not completely dissolve in 24 hrs. when there was present 2 mol. free acid per l.; while on the other hand, with 2 mol. free acid and less Fe_2O_3 the same amt. of Zn dissolved in a few minutes. H. JERMAIN CREIGHTON

The precipitation of tin by iron. I. M. KOLTHOFF. Univ. Utrecht. *Rec. trav. chim.* 39, 606-8(1920).—In reviewing Ada Prins' Beknopte leidraad voor de kwalitatieve analyse (*C. A.* 14, 510) K. has said that Fe is not capable of pptg. Sn from stannous salt solns. Botuman (*C. A.* 15, 351) pptd. Sn from $SnCl_2$ soln. by using ferrum reductum. K. was unable to repeat B.'s expts. The concn. of Sn^{+} ions is less in HCl solns. than in neutral $SnCl_2$ solns., owing to the formation of a complex between $SnCl_2$ and HCl. B. found a difference of potential of 29 millivolts between the Fe and Sn and this would be diminished in acid medium. A good example of such a change is the case of Fe and Cu (Müller, Kapeller, *C. A.* 2, 1521). Fe^{++} can oxidize Cu. If, however, NaF is added to a soln. of Fe^{++} salt which forms a complex with Fe^{++} the Cu is pptd. While under certain conditions Sn may be pptd. by Fe, this is not generally true, and under the conditions used in the detection of Sn in presence of Sb, *i. e.*, in HCl soln., Sn is not pptd. by Fe. Therefore, P.'s statement should be suppressed. E. J. WITZEMANN

Thallic nitrite. G. CANNERY. *Atti accad. Lincei* 29, II, 142-6(1920).—Treatment of a suspension of Tl_2O_3 in water with liquid N_2O_5 , and subsequent evapn. of the soln., even in the cold under reduced pressure, yields, not $Tl(NO_3)_3$, but $TlNO_2$. The latter is also obtained when solns. of $Tl_2(SO_4)_3$ and $Ba(NO_3)_2$ are mixed in the cold, and the resulting liquid is evapd. at low temp. That $Tl(NO_3)_3$ is capable of existence

in soln., although it cannot be obtained in the solid condition, is shown by the results of estns. of the total Ti, the thallic Ti, the nitrous N and the total N, and by the fact that the N collected in the estn. of the HNO_3 contains free Cl, this being liberated by decompn. of the TiCl_3 formed from the $\text{Ti}(\text{NO}_2)_3$ and the NH_4Cl added. Treatment of aq. $\text{Ti}(\text{NO}_2)_3$ soln. with alc. yields a ppt. of the sesquioxide. In ethereal soln. $\text{Ti}(\text{NO}_2)_3$ is far more stable, and the salt seps. in the solid state on evapn. of the solvent; it could not, however, be analyzed directly. Decompn. of $\text{Ti}(\text{NO}_2)_3$ with formation of TiNO_3 takes place solely in accordance with the equation $\text{Ti}(\text{NO}_2)_3 \rightarrow \text{TiNO}_3 + \text{N}_2\text{O}_4$, neither intermediate reduction products nor thalious-thallic complex compds. being formed.

J. C. S.

The oxidation of sulfites in concentrated solutions. J. MILBAUER and J. PAZOU-REE. *Chem. Listy* 15, 34-8(1921).—Concd. solns. of sulfites are oxidized slowly but quite constantly at ordinary temps. by air. (Cf. Lumière and Seywetz, *Rev. gen. chim.* 7, 15). CoSO_4 , used in concns. of 0.01 and 0.001 *M*, acts as a positive catalyzer for this reaction. Mn and Cu salts, contrary to results obtained with dil. solns. by Bigelow (*Z. physik. Chem.* 1898, 493) and Titov (*Z. physik. Chem.* 1903, 641), are not very active catalyzers in concd. solns. of sulfites. In concd. solns., 0.5 *M*, weak alkalinity of the medium intensifies the oxidation, if no pptn. of the catalyzing agent is caused. Strong alkalinity retards the reaction. An acid medium has a similar influence. The rapidity of the reaction increases with rising temps. Cf. *C. A.* 2, 377.

JOHN M. KRNO

The non-biological oxidation of elementary sulfur in quartz media. W. H. MACINTIRE, F. J. GRAY and W. M. SHAW. *J. Ind. Eng. Chem.* 13, 310-13(1921).—Sulfur (0.1251 g.) or S and one or more of the following ingredients in the amts. given were mixed with 250 g. of finely ground unleached quartz containing 14% H_2O in 500-cc. Pyrex flasks: Fe, 10.0806 g.; limonite, 25.3164 g.; CaCO_3 , 0.5076 g.; MgCO_3 , 0.5000 g.; 100-mesh limestone, 0.5181 g.; 100-mesh dolomite, 0.5449 g. The purest obtainable quartz contd. a small amt. of Fe_2O_3 . The biological conditions maintained in the expts. were: unaltered quartz, quartz sterilized by heat, inoculation by soil infusion "A" and inoculation by soil infusion "B." The flasks were maintained under aerobic conditions by stoppering with cotton plugs and under anaerobic conditions by displacing the air with CO_2 and sealing. They were kept in the dark 60 days, then extd. with distd. H_2O and the exts. analyzed for sulfates. By subtracting the values obtained in this way from those obtained from blank expts. the actual increase in sulfates was obtained. In all the flasks kept under aerobic conditions there was an increase in sulfate content, the greatest increase being in those flasks containing S and limonite (456 lbs. per 2,000,000 lbs. of media) or S, limonite and carbonates (412.4 to 519 lbs.), the next greatest in the flasks containing S (222.5 lbs.) or S and carbonates (357.1 to 440.8 lbs.) and the least in the flasks with S and Fe (77 lbs.) or S, Fe and carbonates (94.6 to 136.4 lbs.). In the heat-sterilized flasks there was a smaller increase than in the others, and there was no greater increase in the inoculated than in the unaltered quartz flasks. In the anaerobic- CO_2 series the increase in sulfates in the flasks containing S and quartz or S, quartz and carbonates was not so large as in the corresponding aerobic series, being particularly small (73.4 lbs.) in the flasks containing MgCO_3 . In the flasks containing S and Fe or S, Fe and carbonates there was a decrease below that detd. in blank expts. The S and limonite, and S, limonite and carbonate flasks showed a marked increase except when MgCO_3 was present. A similar series of anaerobic- CO_2 expts. was run with S and N as NaNO_3 , $\text{Ca}(\text{NO}_3)_2$ or $\text{Mg}(\text{NO}_3)_2$ and S, N and Fe. In the flasks containing the smaller amt. of N (10 mg.) there was a marked increase in sulfates, while with 50 mg. N the increase was slight. In both cases, however, when Fe was present there was a decrease in the sulfate content. The expts. indicate that S may be transformed into sulfates by independent chemical action in

the presence of Fe_2O_3 and alkali-earth carbonates. Also in *Soil Science* 11, 249–59 (1921).

G. W. STRATTON

New procedure for the purification of hydrochloric acid. J. LANEQUET. *Bull. soc. chim. belge.* 1920, 309; *Ann. chim. anal. chim. appl.* 3, 59(1921).—Procedures recommended for purifying com. HCl and for removing As are often neither effective or practicable. L. recommends treating the acid with H_3PO_3 or with a hypophosphite (Bougault's reagent), which ppts. As. Secondary reactions take place and eliminate Cl and SO_3 . If HCl contains H_2SO_4 , this can be removed as BaSO_4 by treating the HCl with $\text{Ba}(\text{H}_2\text{PO}_3)_2$.

C. C. DAVIS

Chemical equilibrium between iron, carbon and oxygen (MATSUBARA) 9.

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Handbuch der anorganischen Chemie, in 4 vols. edited by R. Abegg and Fr. Auerbach. Vol. 4, part 1, 2nd half edited by Fr. Auerbach. Die Elemente der sechsten Gruppe des periodischen Systeme, 2nd half. Leipzig: S. Hirzel. 1072 pp. M140, bound M170. For review see *Z. physik. Chem.* 97, 505(1921).

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7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

An outline of a system of qualitative chemical analysis for the positive ions. CLAUD H. HALL, JR. *Trans. Maryland Acad. Sci.* 4, 8(1921).—The first group is pptd. by means of red P instead of HCl, which serves to bring Hg entirely into this group and places all Pb in the second group. Thioacetic acid, or its NH_4 salt, is substituted for H_2S . In the alkali group, K is pptd. by means of phosphotungstic acid. W. T. H.

Separation of the metals of the second analytical group. G. G. LONGINESCU AND G. P. TRONORESCU. *Bull. sec. sci. acad. Roumaine* 6, 159–64(1920).—The H_2S ppt. is treated first with $(\text{NH}_4)_2\text{CO}_3$ soln. to dissolve out the As and its sulfide is partially pptd. by the addition of HCl to the soln. Arsenic is confirmed by the Marsh test. The remaining sulfides are dissolved by treatment with HCl and KClO_3 . If much Pb is present the greater part is removed as chloride at this point. By means of NaOH, the Hg, Bi, Cu and Cd are pptd. as hydroxides and the Pb, Sn and Sb remain in soln. The ppt. is dissolved in HCl and the Hg and Bi are pptd. by means of ammonia. This last ppt. is dissolved in HCl and the test for Hg made with SnCl_2 soln. and for Bi with Na_2SnO_3 soln. in the usual manner. The Cu and Cd are tested for as usual. From the NaOH soln., the Pb is pptd. as sulfate and then the tests for Sb and Sn are carried out as usual. The only novelties suggested consist in the avoidance of ammonium polysulfide and of nitric acid.

W. T. H.

Chemical analysis by positive rays. S. VEIL. *Rev. gén. sci.* 31, 664–71(1920).—A summary of the work of J. J. Thomson on the application of his researches to chem. analysis (*C. A.* 5, 3388; 6, 48, 3223; 7, 2008, 2511, 3452; 8, 1555, 3748; 14, 1928). Diagrams and graphs accompany the text.

C. C. DAVIS

Principles of analysis by means of reducing flames; the detection of traces of manganese in the presence of iron or other substances. JEAN MEUNIER. *Compt. rend.* 172, 678-81 (1921).—When the vapors of a substance are subjected to reduction in a H flame the reaction can be detected by means of the spectrocope. Thus when Pb is formed by such a reduction, the Pb spectrum can be detected when the flame is small and the temp. relatively low. In carrying out the test, the H gas is passed through a small glass tube contg. some of the powdered material to be tested. In studying the lines produced by carefully recrystd. FeC_2O_4 , lines appeared which proved to be caused by Mn. The quantity of Mn present must have been extremely small.

W. T. H.

The entrainment of lime and magnesia by precipitated chromic hydroxide. ER. TOPORESCU. *Compt. rend.* 172, 600-2 (1921).—The pptn. of CaO and of MgO with $\text{Cr}(\text{OH})_3$ formed by treatment with NH_4OH was studied to det. whether the CaO and MgO were carried down physically, as by adsorption, or chemically. The results of the expts. described show that the quantity of CaO and of MgO carried down with the $\text{Cr}(\text{OH})_3$ increases with increased concn. of Ca and of Mg in soln. but reaches a max. when the ppts. correspond to chromites of the compn. $\text{Ca}_2(\text{CrO}_4)_3$ and $\text{Mg}_3(\text{CrO}_4)_2$. In other words, chem. compds. appear to be formed. In schemes of qual. analysis this danger of so much CaO and MgO being carried down in the Fe-Cr group has not been realized.

W. T. H.

The effect of apparatus errors on the accuracy of volumetric analyses. VERNY STOTT. *J. Soc. Chem. Ind.* 40, 63-5T (1921).—The errors incident to titration work are considered in detail on the assumption that the app. used has the max. permissible error permitted in Class A tolerances of the National Physical Laboratory. Excluding such errors as arise from faulty chemical reactions, such as incomplete oxidation or the incomplete sepn. of closely allied elements, and uncertainties in the true values of at. wts., 0.4% may be taken as a fairly representative error which may arise in volumetric work solely due to uncorrected errors in the calibration of the measuring instruments.

W. T. H.

The weighing of the precipitation vessel in quantitative micro-analysis. Two methods based upon this principle. ERICH GARTNER. Tech. Hochschule, Graz. *Monatsh.* 41, 477-497 (1920).—G. describes 2 pieces of app. by means of which the micro-analysis may be conducted in 1 piece of app. The first seps. the solid phase from the liquid by filtration through an asbestos filter; the second depends upon centrifugation. The original paper must be consulted for details, design of the app., etc. C. J. WEST

Titration with the hydrogen electrode. W. D. TREADWELL AND L. WEISS. *Helvetica Chim. Acta* 3, 433-46 (1920).—In most directions for electrometric titrations, an electrode of platinized Pt is prescribed, which is rather difficult to prepare. By taking small tubes of unglazed porcelain, dipping them in AuCl_3 soln. and heating gently, a thin deposit of Au is obtained which can be strengthened by electrodeposition from a cyanide soln. The deposit under the microscope has the desired rough surface but adheres well. Upon this Au a very thin layer of Pd black is deposited electrolytically. In the titration, 2 of these electrodes are united to form an element, one being placed in a buffer soln. and the other in the soln. to be analyzed; about 2 bubbles of H per sec. are evolved about the latter electrode in the usual manner. With such an electrode, the changes in e. m. f. during the titration of an acid can be detd. with sufficient accuracy by direct reading with a millivoltmeter. Examples of work with this H electrode are discussed in detail and it is shown that the ionization const. can be easily computed by the drop in e. m. f. during the electrometric titration and that strong acids can be detd. in the presence of weaker ones.

W. T. H.

The determination of iodic acid and silver by electrometric titration. W. S. HENDRIXON. *J. Am. Chem. Soc.* 43, 858-66 (1921).— IO_3^- can be reduced by a measured vol.

of I^- soln. in the presence of H_2SO_4 and the excess titrated with $KMnO_4$ electrometrically. Similarly, I^- can be titrated directly with IO_3^- . Ag can be detd. electrometrically with pure iodide and $KMnO_4$ and this element can be used for standardizing both iodide and permanganate.

W. T. H.

The electrometric titration of phosphoric acid and its salts. I. M. KOLTHOFF. *Z. anorg. allgem. Chem.* 112, 165-71(1920).— H_3PO_4 behaves as a strong acid, and cannot be titrated electrometrically in concd. soln. (cf. *C. A.* 14, 3378). In dil. soln. it can be titrated in exactly the same way as a mono- or a dibasic acid, the first equiv. point being very sharp, the second less distinct. The electrometric method of titration has the advantage over the indicator method that indicators give indistinct end-points in very dil. solns. of H_3PO_4 . Secondary phosphates, for example, Na_2HPO_4 , can be titrated with acids when the concn. is less than 0.01 molar. When the concn. is greater, the break in the cond. curve at the point corresponding with primary phosphate is indistinct, owing to the dissoc. of H_3PO_4 . Secondary phosphates cannot be titrated with alkali, on account of the hydrolysis of the tertiary phosphates. Dil. solns. of pyrophosphates can be satisfactorily titrated with acid to the secondary salt. The break corresponding with the tertiary salt is indistinct.

J. C. S.

The electrometric estimation of carbonic acid and its salts. I. M. KOLTHOFF. *Z. anorg. allgem. Chem.* 112, 155-64(1920).—Solns. of H_2CO_3 from 0.0015 to 0.02 mol. in strength can be titrated electrometrically with alkali. The cond. straight-line curve becomes steeper after the formation of the H_2CO_3 , and again steeper after the formation of the normal carbonate. The breaks in the curve, however, are not sharp, especially in very dil. solutions, in which, owing to the considerable hydrolysis of the carbonate, the straight-line portions become rounded into a continuous curve. The sharpness of the titration can be greatly increased by having present an excess of Ca salt ($CaCl_2$) to ppt. the carbonate as it is formed. Time must be allowed during the titration for the pptn. of the $CaCO_3$. H_2CO_3 cannot be titrated with carbonate to the hydrogen carbonate electrometrically, because the angle between the two portions of the curve is too obtuse. On the other hand, carbonate can be titrated with acid. According to the dilution, the cond. may fall (in dil. soln.) or rise (in stronger solns. above 0.1-N) up to the hydrogen carbonate point. From this point, which is not sharp, to the neutral point, the cond. increases gradually, and at the neutral point there is a sharp rise. The neutral point is very sharp in extremely dil. solns. Free alkali hydroxide can be estd. in presence of carbonate by titration with acid if not present in too small an amt. The amt. of hydrogen carbonate can be detd. by titration with alkali or acid, but its amt. must not be too small, or the direction of the corresponding portion of the curve cannot be detd. with sufficient accuracy. A very weak acid, such as boric acid, can be titrated in presence of Na_2CO_3 with alkali hydroxide with satisfactory results.

J. C. S.

The electrometric titrations of phenols. I. M. KOLTHOFF. *Z. anorg. allgem. Chem.* 112, 187-95(1920).—Phenol and the cresols can be accurately titrated electrometrically with alkali in 0.1 or 0.01N soln. Vanillin and Na phenolsulfonate can be similarly titrated. In salicylic acid the hydroxyl group loses its acidic character and cannot be titrated, but its esters, for example, salol or Me salicylate, can be accurately titrated as phenols; *p*-hydroxybenzoic acid behaves as a dibasic acid. Thymol and β -naphthol also are satisfactorily titrated. Of the dihydroxybenzenes, catechol behaves as a monobasic acid, the cond. curve showing only one break, corresponding with the first hydroxyl group; quinol behaves as a dibasic acid, the first break not being very distinct, while resorcinol, which also behaves as a dibasic acid, gives better results when titrated with Ba instead of Na hydroxide. Pyrogallol functions as a dibasic acid, not monobasic, as stated by Thiel and Roemer (*C. A.* 2, 3015, 3330), and so does phloroglucinol, while

gallic acid, having a carboxyl in addition to three hydroxyl groups, behaves as a tribasic acid.

J. C. S.

The electrometric titration of alkaloids and their salts. I. M. KOLTHOFF. *Z. anorg. allgem. Chem.* 112, 196-208(1920).—Alkaloids or their salts can be titrated with satisfactory accuracy by the electrometric method in very dil. solns. The alkaloids themselves are titrated with acid; the cond. rises steadily from the commencement of the titration, and at the point where salt formation is complete the rate of increase of cond. suddenly augments. The alkaloid salts are titrated with alkali, and in these cases, also, the cond. curve rises throughout the titration, with a sharp break at the neutral point. In the case of a basic salt, such as quinine hydrochloride, in which the second dissoc. const. is not too small, the acid content can be detd. by titration with alkali and the alkaloid by means of acid. Titrations of alkaloids or their salts with indicators, such as phenol- or thymolphthalein for alkali and methyl-red or dimethyl-yellow for acid titration, generally give uncertain results, because a solvent such as alc. or CHCl_3 has to be used. For the electrometric titration of the alkaloid salts, no solvent need to be used, but for the titration of the free alkaloids they are generally dissolved in 55% alc. The alkaloid salts examd. included quinine hydrochloride, strychnine nitrate, cocaine and tropacocaine hydrochlorides, novocaine, atropine sulfate and morphine and ethylmorphine hydrochlorides. In the case of morphine hydrochloride, it was found best to titrate in 50% alc.; no distinct break was found in the cond. curve at the neutral point, but, on continuing the titration with alkali, morphinate formation was indicated by a very sharp break in the curve. The alkaloid bases examd. included quinine, hydrastine, codeine, morphine, nicotine, theobromine, and caffeine. The last is a very weak acid with a dissoc. const. less than 10^{-14} , while that of theobromine is about 10^{-10} . Accordingly, it was found that the theobromine could be exactly estd. in a mixt. with caffeine by dissolving in alkali and titrating back with acid. The break in the cond. curve was quite distinct.

J. C. S.

The acidimetric estimation of heavy metals in their salts. I. M. KOLTHOFF. *Z. anorg. allgem. Chem.* 112, 172-86(1920).—Expts. were made to det. with what degree of accuracy the salts of heavy metals which form insol. hydroxides can be titrated with alkali hydroxides, either by the electrometric method or with the help of indicators. The statement of Harned (*C. A.* 11, 429) that MgSO_4 can be estd. electrometrically by titration with Ba(OH)_2 was confirmed. Satisfactory results were also obtained by pptg. the Mg(OH)_2 with excess of standard alkali, filtering, and titrating back with standard acid. The electrometric method gave unsatisfactory results when ZnSO_4 was titrated with Na or Ba hydroxide, owing to the pptn. of basic salt. Better results were obtained by titrating NaOH with ZnSO_4 . In the case of Cu sulfate also, the formation of basic salt interferes with the titration, and satisfactory results could not be obtained. HgCl_2 can be titrated electrometrically with accuracy by running the soln. into NaOH soln., which should not be stronger than 0.01N. In the case of Al salts, when these are titrated with Na or Ba hydroxide, a sharp break in the cond. curve is not obtained at the neutral point, but there is a very sharp break at the point where the formation of aluminate is complete. Al(OH)_3 behaves, therefore, as a mono-basic acid. $\text{Al}_2(\text{SO}_4)_3$ or alum can be titrated with NaOH at the boiling temp. in presence of excess of $\text{Ba(NO}_3)_2$, phenolphthalein being used as indicator. Slight excess of alkali is run in and titrated back with acid. The results are accurate.

J. C. S.

A new method for copper assaying. GEORGE J. HOUGH. *Eng. Mining J.* 111, 505(1921).—The method is a modification of Fleitmann's procedure. It depends upon the pptn. of Cu, the dissolving of the ppt. by ferric salt and the titration of the resulting ferrous ions with permanganate. For ores free from Sb and Bi dissolve 0.5 g. in aqua regia, add 10 cc. H_2SO_4 and evap. to fumes. Cool, dil., add 1 drop of HCl if Ag is present and filter. Ppt. the Cu with Al foil, boiling gently to detach the Cu

from the foil. Decant through a filter and wash twice by decantation with hot water. Dissolve the pptd. Cu with about 10 cc. of satd. FeCl_3 soln., heat gently and dil. to 200 cc. with cold water. Add 5 cc. of sirupy H_3PO_4 and titrate with KMnO_4 . 1 cc. of 0.1N KMnO_4 corresponds to 0.00316 g. of Cu instead of 0.00318 g. Cu, the theoretical value. If Sb is present, fuse the ore with Na_2CO_3 and S, leach with water and dissolve the residual sulfides in HNO_3 . Then continue with the H_2SO_4 treatment as above. If Bi is present, evap. the original soln. nearly to dryness, dil. with hot water and add an excess of $(\text{NH}_4)_2\text{CO}_3$ soln. Filter and treat the filtrate with H_2SO_4 , etc.

W. T. H.

The detection and estimation of platinum in ores. C. W. DAVIS. *Bur. Mines, Tech. Paper No. 270*, 26 pp. (1921).—The button produced by fire assay may contain Au, Ag and Pt metals. By parting with HNO_3 most of the Pt and Pd go into soln. The Au and remainder of the Pt may be dissolved away from the other Pt metals by treatment with dil. aq. regia. The HNO_3 soln. obtained by parting the original button may be treated with HCl to ppt. AgCl . After filtration and neutralization with Na_2CO_3 , the Pt and Pd may be pptd. by boiling with formic acid. To separate these metals, treatment with HNO_3 dissolves Pd and leaves Pt. The aqua regia soln. referred to above may be evapd. to dryness 2 times, the residue dissolved in water and the Au removed by treatment with oxalic acid. Pt and Pd are then recovered as in the preceding process. This represents an outline of the method which is recommended for the detection and estimation of Pt in vein material and is sufficiently accurate for com. purposes. The paper also contains data on the occurrence of Pt, its properties and characteristic chem. behavior, a description of 9 other methods for detg. Pt in ores and a selected bibliography on the assay of Pt in ores. A colorimetric method, based upon the color produced by reduction with SnCl_2 is recommended for the estn. of less than 0.2 mg. of Pt.

W. T. H.

The estimation of small quantities of gold, silver, and the platinum metals in material high in copper. C. W. DAVIS. *Bur. Mines, Repts. of Investigations No. 2228*, 5 pp. (1921).—The estn. of Pt in ores by fire assay methods (see preceding abstract) can be checked by certain combination methods of wet and dry assay. The treatment recommended for oxidized Cu ores depends upon the fact that the Cu in such materials is sol. in dil. H_2SO_4 , whereas, Ag, Au and the Pt metals are not. Dissolve 1 assay ton of powdered ore in 500 cc. of 3.6N H_2SO_4 and to the resulting soln. add NaCl to ppt. Ag and a little KI to ppt. Pd. Boil and add 10 cc. of satd. $\text{Pb}(\text{OAc})_2$ to help coagulate the residue. Decant off the soln. and repeat the treatment until most of the Cu is removed. Heat the residue and filter with PbO and finish by dry assay. With sulfide ores, a very careful roasting will oxidize the material so that the above combination method can be employed. With bullion, a mixt. of 1 part concd. H_2SO_4 and 10 pts. H_2O_2 dissolves all the Cu and none of the Pt metals except Pd, which can be pptd. by means of a little KI after the most of the peroxide has been boiled off. Finally the last traces of peroxide are removed by treatment with ferrous salt, the Ag is pptd. by NaCl and the analysis continued as above.

W. T. H.

Nitroso R-salt, a new reagent for the detection of cobalt. H. S. VAN KLOOSTER. *J. Am. Chem. Soc.* 43, 746-9 (1921).—By treating R-salt ($\text{Na } 3,6\text{-}\beta\text{-naphtholdisulfonate}$) with HNO_2 a golden yellow compd. is obtained, which forms a green substance with Fe^{++} and gives a brownish red color with Ni^{++} . With Co^{++} a beautiful red dye is obtained, which is very stable and analogous to the Co compd. of $\alpha\text{-nitroso-}\beta\text{-naphthol}$. It probably corresponds to the formula $(\text{C}_{10}\text{H}_7\text{NO}_2\text{S}_2\text{Na})_2\text{Co}$. The aq. soln. of the nitroso-R salt can be used for the detection of Co. The color is produced in a dil. soln. contg. AcONa and interfering Fe and Ni colors are destroyed by boiling with a little HNO_3 .

W. T. H.

The determination of iron by the cupferron method. G. E. F. LUNDELL. *J. Am. Chem. Soc.* **43**, 847-51(1921).—Archibald and Fulton (*C. A.* **14**, 2454) have claimed that the Fe^{+++} salt of cupferron is appreciably sol. in the acid soln. from which it is formed but the results of the expts. here described indicate that this is not true. The ppt., however, often tends to creep through the filter and if an opalescent filtrate is obtained, it should be refiltered after digestion for a suitable time. W. T. H.

The volumetric determination of arsenious compounds by means of potassium dichromate. R. MEURICE. *Ann. chim. anal. chim. appl.* **3**, 85-6(1921).—The arsenious soln. is treated with KBr and HCl and titrated with standard $\text{K}_2\text{Cr}_2\text{O}_7$ until free Br_2 is obtained. M. assumes that Br_2 is formed by the action of the dichromate on the bromide and that the Br_2 at once reacts with arsenite to form arsenate. The soln. to be titrated, in a small vol., is treated with 20 cc. of 10% KBr soln. and 20 cc. of concd. HCl. In the beaker a glass tube is inserted which is open at the bottom and is fitted with a stopper at the top. Through the stopper two delivery tubes are inserted, one reaching to the bottom of the tube for introducing a column of air and the other extending from just below the stopper, through 2 right-angle bends into a test tube contg. iodo-starch soln. By means of this contrivance it is possible to bubble air through a part of the titrated soln. The $\text{K}_2\text{Cr}_2\text{O}_7$ soln. is added slowly until enough Br is carried over by the current of air to give a blue color in the iodo-starch soln. within 30 sec. W. T. H.

A new method for the separation of the hydroxides of iron, chromium and aluminium. MME. M. LEMARCHANDS AND M. LEMARCHANDS. *Ann. chim. anal. chim. appl.* **3**, 86-7(1921).—Wash the ppt. of $\text{Fe}(\text{OH})_3$, $\text{Al}(\text{OH})_3$ and $\text{Cr}(\text{OH})_3$ obtained by pptn. with NH_4OH , with water until the odor of NH_3 can no longer be detected. Place the ppt. in a 10% soln. of NaOH contg. some pure Na perborate. Boil 2 min. and filter. The filtrate contains Na_2CrO_4 and NaAlO_2 ; the residue is $\text{Fe}(\text{OH})_3$. The ppt. can be dissolved in acid and tested for Fe in the usual way. Divide the filtrate into 2 portions. In the first portion, which should constitute about $\frac{3}{4}$ of the entire filtrate, add NH_4Cl and boil to ppt. the Al as hydroxide. In the other portion test for Cr by $(\text{AcO})_2\text{Pb}$ in AcOH soln., or with perborate in H_2SO_4 soln., whereby blue perchromic acid is formed. W. T. H.

Determining carbon in aluminium. J. A. SONDAL. *Tid. Kemi* **17**, 234-45(1920).—The C content of com. Al, which in the samples tested varied from 0.012 to 0.087%, can be detd. by methods analogous to those used in the analysis of iron and steel. Two methods are described in detail. Of these the first is based upon the removal of the Al by treatment with K_2CuCl_4 and weighing the residue; the second method is an adaptation of the wet combustion method of Corleis. The oxidizing mixt. used contained for each g. of Al, 15 cc. of satd. CuSO_4 soln., 15 cc. of satd. CrO_3 soln., and 60 cc. of a mixt. contg. 5 parts satd. CrO_3 soln., 75 parts concd. H_2SO_4 , 20 parts H_3PO_4 and 35 parts water by vol. The metal dissolves rapidly in this mixt. and care must be taken that the reaction does not become too violent at the start. A. R. ROSE

Detection of graphite and its distinction from similar minerals. O. HACKL. *Verh. geol. Reichsanst. Wien.* **1918**, 261-2.—Simple methods are indicated for distinguishing between carbonaceous substances and oxides of Fe or Mn, metallic Mn, and Sb. The following microchem. method is recommended for the detection of even traces of graphite. The substance is completely freed from carbonates by treatment with boiling dil. HCl, after which it is washed and dried. The residue is fused with ten times its wt. of KNO_3 , which converts C into carbonates, and the product is extd. with a little water. The presence of C is shown by the evolution of CO_2 after addition of dil. HCl. If only traces of C are present, a drop is treated successively with Sr acetate and dil. HCl; evolution of gas is then readily observed under the microscope, as is also the eventual re-soln. of pptd. SrCO_3 . J. C. S.

Nitrites in Glauber's salt. "ANALYST." *Pharm. J.* 106, 192(1921).—No test for the absence of NaNO_2 in com. Na_2SO_4 is given in the Brit. Pharm. Recent com. samples showed 0.003% of NaNO_2 . On addition to the soln. of a crystal of KI, a few drops of HCl and a little boiled and cooled starch- H_2O , a distinct blue color will be seen with this small amt. of NaNO_2 present. The amt. of I will increase through the O of the air by catalytic action. S. WALDBOTT

Detection of hydrogen cyanide. JAMES MOIR. *J. S. African Assoc. Anal. Chem.* 3, 16(1920); cf. *C. A.* 4, 2618.—Filter paper is moistened with a reagent consisting of α -tolidine 1 g., Cu acetate 1.5 g., glacial AcOH 0.5 g., and water 100 cc. and is then suspended in the atm. to be tested. A blue color appears on the paper if the air contains as little as 1 part of HCN in 2 millions. J. C. S.

Note on the use of potassium permanganate in the determination of nitrogen by the Kjeldahl method. C. T. DOWELL AND W. G. FRIEDEMANN. *J. Ind. Eng. Chem.* 13, 358(1921); cf. Cochrane, *C. A.* 15, 217.—During the past year the use of KMnO_4 at the end of the digestion has been discontinued but Na_2SO_4 or K_2SO_4 and Hg have been used with the H_2SO_4 . Without the addition of sulfate digestions were incomplete in 2.5 hrs. W. T. H.

The use of potassium permanganate in the determination of nitrogen by the Kjeldahl method. D. C. COCHRANE. *J. Ind. Eng. Chem.* 13, 358(1921).—In the values cited by Dowell and Friedman (preceding abstract) lower results were obtained in 5 out of 8 samples analyzed without the use of KMnO_4 . In emphasizing the need of KMnO_4 in Kjeldahl digestions, however, C. had reference to the original method, in which no alkali sulfate is added to raise the b. p. of H_2SO_4 , as in the Gunning modification. W. T. H.

Micro-estimation of nitrogen in agricultural products. W. GEILMANN. *J. Landw.* 68, 235-54(1920).—The practicability of the micro-Kjeldahl method is described. Sources of error and difficulties are pointed out. The great advantages of the method are that one can use a small sample, small quantities of reagents and get results quickly. The method is valuable in the estn. of pure proteins. F. M. SCHERTZ

Determinations of nitrous acid in mixed acids and waste acid. H. TOUSSAINT. *Essen. Z. angew. Chem.* 34, Aufsatzteil, 102(1921).—The method is similar in principle to that proposed by L. Winkler for the analysis of water. Into 1 side-neck of a liter Woulfe bottle, insert a stopper and small filter and into the other side-neck place a cork stopper through which a glass tube moves easily and serves for the introduction of CO_2 . Pour 700 cc. of air-free, distd. water into the flask and replace the air in the flask with CO_2 . Then add from a buret a suitable vol. of the acid to be tested and immediately close the middle neck of the bottle by means of a large glass rod covered with rubber tubing. Push down the gas delivery tube nearly to the bottom of the bottle and add KI soln. through the funnel. Mix by a rapid stream of CO_2 and finally titrate the liberated I with $\text{Na}_2\text{S}_2\text{O}_3$ soln., adding the reagent through the middle neck of the Woulfe bottle. W. T. H.

The volumetric determination of polysulfide sulfur. A. WOBEL. *Z. angew. Chem.* 34, Aufsatzteil, 73(1921).—The reaction between polysulfide and neutral alkali sulfite to form thiosulfate and monosulfide is made the basis of the method. $\text{Na}_2\text{S}_x + x\text{Na}_2\text{SO}_3 \rightarrow x\text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{S}$. Dil. a measured vol. of the polysulfide soln. to be analyzed with boiled, distilled water and add an excess of 10% Na_2SO_3 soln. Heat to about 50°, with frequent shaking, until the soln. is colorless. After 15 min. more, cool and dil. with boiled water to a definite vol. and in an aliquot part det. the thiosulfate in the presence of sulfide by the method of Bodnár or of Feld-Sadner. W. T. H.

Verification of the purity of and quantitative analysis of organic compounds by their oxidation with chromic acid. H. CORDEBARD. *Nancy. Ann. chim. anal. chim. appl.*

3, 49-53(1921).—The org. compd. is oxidized at a high temp. by a mixt. of coned. H_2SO_4 and excess $\text{K}_2\text{Cr}_2\text{O}_7$. Excess $\text{K}_2\text{Cr}_2\text{O}_7$ is detd. by $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2$ soln. with $\text{K}_3\text{Fe}(\text{CN})_6$ as indicator. Five classes of compds. require varying procedure, those (1) containing only C, H, and O, and easily oxidized, (2) with only C, H, and O, but either volatile at the reacting temp. or forming a first product which is volatile, (3) with only C, H, and O, but giving HOAc as oxidation product, (4) containing N, P, S, As or Sb, and (5) difficult to oxidize. Procedure: For compds. of class (1) add to 20 cc. of N $\text{K}_2\text{Cr}_2\text{O}_7$ soln. an insufficient wt. of org. compd. completely to reduce it. Add 20 cc. of H_2SO_4 (66° Bé.), stirring constantly. The temp. rises to about 100° and gas is evolved. Boil gently 5 min., keeping below 180°, cool, add 100-150 cc. of H_2O , and a slight excess of 0.1 N $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2$ soln. to a blue with $\text{K}_3\text{Fe}(\text{CN})_6$. Then add 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ until $\text{K}_3\text{Fe}(\text{CN})_6$ gives no blue. Thirty compds., both aliphatic and aromatic, were analyzed, and it was found that the theoretical wt. of O necessary to oxidize corresponded exactly with the $\text{K}_2\text{Cr}_2\text{O}_7$ consumed in the procedure described. A table gives the wt. of each of the 30 compds. oxidized by 1 cc. of N $\text{K}_2\text{Cr}_2\text{O}_7$. From these values the purity of a known compd. can be detd. by a comparison of the actual value with that in the table. Quant. results on compds. of classes (2), (3), (4), and (5) are promised in a further publication. In general oxidation of compds. with Et groups or several Me groups on the same C atom proceeds as in class (1) except that compds. with C_6H_5 groups require only the empirical proportion of 2.1 atoms of O to form HOAc . Oxidation of N compds., when N is combined with O, liberates free N; when N is in an amine group, it liberates NH_3 . Oxidation of compds. with P, S, As or Sb forms the most highly oxidized anhydride of the particular element. C. C. DAVIS

Determination of small quantities of iron in organic liquids, wine in particular. P. MALVEZIN and CH. RIVALLAND. *Ann. chim. anal. chim. appl.* 3, 90-2(1921).— Fe^{++} salts can be reduced by the action of thiosulfate in accordance with the following equation: $2\text{FeCl}_3 + 2\text{Na}_2\text{S}_2\text{O}_3 \longrightarrow \text{Na}_2\text{S}_4\text{O}_6 + 2\text{NaCl} + 2\text{FeCl}_2$. Na salicylate gives a violet color with ferric salts so that the end-point of the above reaction can be detd. by the disappearance of the color. The reduction is catalyzed by the presence of a little Cu salt. The reaction has been used for the detn. of Fe in wines contg. 0.006 to 0.5 g. per liter by the following procedure: Evap. 20 cc. of the wine to dryness on a water bath and heat the residue until it is well charred. Triturate the mass with 10 cc. of dil. HCl, filter and wash, catching the filtrate in an Erlenmeyer flask. Add 0.5 cc. of H_2O_2 to oxidize the Fe and allow to stand 15 min. at 30°. Boil off the excess H_2O_2 and add 5 cc. of 1% CuSO_4 soln. Add 1 cc. of 0.2% Na salicylate soln., heat to boiling and titrate with standard 0.5% $\text{Na}_2\text{S}_2\text{O}_3$ soln. to decolorization. For the estn. of small quantities of Fe this method has been found more satisfactory than methods depending upon KMnO_4 titration or upon the formation of $\text{Fe}(\text{CNS})_2$. It is sensitive to at least 1 mg. of Fe per liter. If the soln. contains less than 6 mg. per liter, about 40 cc. should be taken for analysis. Also in *Bull. soc. chim.* 29, 237-40(1921).

W. T. H.

Estimation of selenium in organic compounds. FRITZ WREDE. *Z. physiol. Chem.* 109, 272-5(1920).—The method here described is based on that given by Pregl for the estn. of H_2SO_4 ("Die quantitative organische Mikroanalyse," 1917, 122; Cf. C. A. 14, 714), and consists in burning the substance in a tube in O in presence of Pt as catalyst and titrating the selenious acid formed with centinormal NaOH soln., NaHSeO_3 being neutral to methyl orange. J. C. S.

Determination of methanol in sulfite alcohol. RUDOLF SIEBER. Kramfors, Sweden. *Papierfabr.* 19, No. 9, 189-92(1921).—S. shows that the colorimetric method of Denigès is the most suitable method for detg. MeOH in sulfite EtOH in the factory. Detailed directions are given, together with tables for calcg. alc. content from the readings of the color scale. C. J. WEST

Isolation of formic, acetic, and lactic acids. ISENOSUKE ONODERA. *Ber. Ohara Inst. landw. Forsch.* 1917, i, 231-59.—The 3 acids are extd. from the mixed soln. by means of ether. In one portion of the ethereal soln. formic acid is titrated with KMnO_4 , and in this oxidized portion the lactic acid is estd. as oxalic acid. AcOH is removed from the decomposed soln. by means of ether, and the ext. is again distd. The method is trustworthy, and its accuracy is not influenced by the presence of small amts. of propionic and butyric acids. J. C. S.

The determination of maltose and of lactose in the presence of other reducing sugars by the use of Barfoed's solution. LEGRAND. *Compt. rend.* 172, 602-4(1921).—Barfoed's soln. (1 pt. $(\text{AcO})_2\text{Cu}$ in 15 pts. H_2O ; 200 cc. of this soln. is treated with 5 cc. of 38% AcOH) can be used for the detn. of maltose or of lactose in the presence of other reducing sugars. The monoses (glucose, levulose, galactose) form Cu_2O from such a soln. but the bioses (maltose, lactose) do not. Maltose and lactose, therefore, can be detd. by the difference in the reducing power of the saccharine soln. towards Fehling's soln. and toward Barfoed's soln. Sieben (*Z. Ver. Rubenzucker Ind.* 34, 837-53(1881)), in order to avoid the loss of acetic acid carried out the reduction of Barfoed's soln. by heating at 40° on a water bath in a sealed vessel. There is no appreciable loss of AcOH , however, if the reduction to Cu_2O is accomplished by boiling 3 min. in an Erlenmeyer flask using 5 cc. of soln. with about 0.1 g. sugar and 15 cc. of Barfoed's soln. The Cu_2O was collected on an ordinary filter and detd. by treatment with $\text{Fe}_2(\text{SO}_4)_3$ and KMnO_4 . The method may be applied to the analysis of germinating grains and to the detn. of sugar transformed into invert sugar in concd. milks. W. T. H.

Generalization of the Salkowski, Liebermann, and Schiff reactions (differentiation of some compounds of the terpene series). GALAVIELLE, PORTES and CRISTOL. *Bull. sci. pharmacol.* 28, 70-2(1921).—By the Salkowski reaction (cf. *C. A.* 4, 935) in solns. of terpenes in CHCl_3 , the Schiff reaction and the H_2SO_4 test, the authors claim to be able to differentiate qual. between cholesterol and the terpenes when Liebermann's reaction is used as an accessory (cf. *C. A.* 3, 1888). A tabular presentation of the results of the 4 tests on cholesterol, terpene, Japan camphor, synthetic camphor, Borneo camphor, turpentine, sassafras camphor, buchu camphor and menthol is given.

F. S. HAMMETT

The analysis of liquid and gaseous mixtures of ether, alcohol and water. IRVINE MASSON and T. LAWSON MCEWAN. *J. Soc. Chem. Ind.* 40, 29-32T(1921).—By extn. with petroleum ether, and making proper allowance for the partition of ether and alc. between the 2 layers, the ether content can be detd. with an error of not more than 1%; if this result and the d. of the sample are compared with the d. of synthetic mixts. of alc., ether and water, the alc. content can be found within 1%. In the case of vapors, similar principles apply after absorption in H_2SO_4 . For details of manipulation and the 4 tables to be used, the original paper must be consulted. W. T. H.

Advantages and disadvantages of filter paper with fine pores. J. GROSSFELD. *Z. angew. Chem.* 34, Aufsatzteil, 73-4(1921).—For work where an ashless filter is unnecessary a paper with coarse pores filled with infusorial earth has been found suitable.

W. T. H.

The precipitation of tin by iron (KOLTHOFF) 6. A method of constructing rock-analysis diagrams on a statistical basis (RICHARDSON) 8. Determination of the uranium and thorium content of minerals (BORGSTRÖM) 8.

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8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

Stibnite from Felsöbanya. OSCAR NEFF. Heidelberg. *Beitr. Kryst. Mineralogie* **1**, 107-57(1916).—A detailed crystallographic study of over 100 crystals yielded 17 new forms and many data as to form relations, abnormalities, etc.

E. T. W.

Solution and growth forms of quartz from sodium tetraborate solutions heated under pressure. GABRIEL LINCIO. Turin. *Beitr. Kryst. Mineralogie* **1**, 87-101(1916).

—The Spezia app. for heating minerals in contact with solns. under pressure was used. Spheres of quartz were placed in this, one above and one below a vessel containing quartz fragments, and the whole was surrounded by a 6% aq. soln. of $\text{Na}_2\text{B}_4\text{O}_7$. In the growth chamber the temp. reached about 170° , in the soln. chamber 320° . Chem. reaction occurs between the quartz and the borax, apparently with the formation of a Na borosilicate. After 25 days the app. was opened and the growth and soln. figs. on the respective spheres were studied. The trigonal character of the mineral is strikingly brought out, and conclusions can be drawn as to the mechanism of soln. and deposition processes from the features exhibited.

E. T. W.

Andesine from Hohenstein, Kremsthal, Lower Austria. O. GROSSPIETSCH. *Sitzb. Akad. Wiss., Wien* **127**, 439-47(1918); *Neues Jahrb. Min. Geol.* **1920**, I, 132.—Analysis of crystals gave: SiO_2 59.98, Al_2O_3 24.67, Fe_2O_3 0.54, CaO 7.26, MgO trace, Na_2O

7.36, ign. 0.09, sum 99.90%; sp. gr. 2.87, corresponding with $\text{Ab}_{44}\text{An}_{56}$. The optical consts. are given.

J. C. S.

Vesuvianite in chemical relationship. GUSTAV TSCHERMAK. *Sitzb. Akad. Wiss. Wien, Math.-Naturw. Kl.* 128, I, No. 4, 25 pp. (1919).—The best available analyses of vesuvianite are assembled, and their indications as to the formulas of the isomorphous groups entering into this mineral are worked out. It is found that for all vesuvianites the formula holds: $4 \text{Gr. } \alpha(2S' + T') \cdot \gamma(2A' + T') \cdot \delta(2E' + S') \cdot \epsilon(2E' + A')$, where $\alpha + \gamma + \delta + \epsilon = 1$. In the simpler cases, α and $\epsilon = 0$, γ and δ each = $1/2$. The groups are: $4 \text{Gr.} = \text{Ca}_{12}\text{Al}_8\text{Si}_{12}\text{O}_{48}$, $S' = \text{H}_2\text{R}_3\text{Si}_2\text{O}_9$, $A' = \text{H}_2\text{R}_3\text{Al}_2\text{SiO}_6$, $T' = \text{H}_2\text{R}_3\text{Si}_2\text{O}_9$, and $E' = \text{H}_2\text{R}_3\text{SiO}_6$. It is thought that the 4 garnet groups (Gr) det. the tetragonal symmetry of the mineral, while the monoclinic character of the other groups lead to the partial monoclinic features often shown.

E. T. W.

Fibrolite (sillimanite) as a gem stone from Burma and Ceylon. L. J. SPENCER. *Mineralog. Mag.* 19, 107-12 (1920).—The specimens from Burma came from the ruby mines at Mogok, and include a fine faceted gem and a number of water-worn prismatic crystals and elongated pebbles. The cut stone is transparent, flawless and of a pale sapphire-blue color. Its wt. is 0.816 gram and sp. gr. 3.25. Pleochroism is strong, varying from colorless to sapphire blue. $H. = 7\frac{1}{2}$ (the value 6-7 given in text books is too low, owing to detns. made on aggregates and not on single crystals). $N_{\alpha} 1.6584$, $\beta 1.6596$, $\gamma 1.6789$; $\gamma - \alpha = 0.0205$ (prism method). The plane of the optic axes is parallel to (010) and the + Bx coincides with the c axis. $2E(\text{air}) = 52^\circ 2'$; $2V$ (calcd. from α, β, γ) = $28^\circ 2'$. A second lot of 5 gem crystals is from Ceylon (exact locality unknown). One of these somewhat etched and corroded measures $1 \times \frac{1}{2}$ cm. and about $1\frac{1}{2}$ mm. thick, and shows the forms (010), (110), (450), and (011). This material may be described as *fibrolite cat's eye*.

W. F. HUNT

Optical characters of epidote. M. GOLDSCHLAG. *Min. petr. Mitt.* 34, 23-60 (1917); *Neues Jahrb. Min. Geol.* 1920, 1, Ref. 135-7.—Optical detns. were made on clinozoisite and epidote from various localities, and the results correlated with the chem. compn. (percentage of ferric Fe reckoned as an Fe epidote mol.). The following new analysis, by KAROLINE LUDWIG, is given of epidote from Pfarrerbr. Zöptau, Moravia: SiO_2 38.34, Al_2O_3 26.11, Fe_2O_3 9.67, FeO 1.07, CaO 23.93, MgO 0.34, sum 99.46%.

J. C. S.

Minerals from Madagascar and the Urals. RENÉ CHARLES SABOT. Univ. Geneva. *Thesis* 1914, 1-138; *Neues Jahrb. Min. Geol.* 1920, 1, Ref. 138-42.—Crystallographic, and optical detns., usually with analyses, are given for a number of minerals. Most of the data have been previously published (Duparc, *C. A.* 4, 2082; 8, 39, 1724), but the following analyses appear to be new. I, Muscovite, plumose mica, from Ampatsakana, Madagascar. II, Spessartite crystals from Takovaya, Urals. Blue apatite, occurring with rubellite and feldspar at Antsongombato, Madagascar, gave: P_2O_5 40.09; CaO 54.45; MnO 1.80; Cl 0.20; F [3.46]; d. 3.2013.

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO
I.	44.35	37.40	—	5.30	0.30	0.19
II.	35.12	20.40	2.06	6.78	33.16	2.10
	MgO	K_2O	H_2O	Sums	Sp. gr.	
I.	1.67	5.94	5.29	100.44*	2.8908	
II.	0.15	—	—	99.77	4.1577	

*Also TiO_2 , Na_2O traces.

J. C. S.

The determination of the uranium and thorium content of minerals by measuring their radioactivity. L. H. BORGSTRÖM. Helsingfors. *Finska Kem. Meddel.* 1917, 14 pp.—The mineral is finely ground in an agate mortar, mixed into a paint with CHCl_3 and brushed on a surface several cm. square. By comparing the rates of discharge of an electroscope caused by 2 films, one with 7 and the other with 10 mg. per sq. cm. it is

possible to distinguish between Th and U minerals. The latter show about equal activity in both, while Th compds. show 10–15% less discharge time in 10 mg. than in 7 mg. films. From the formula $R = 0.07069 U + 0.02054 Th$ (R = discharge time in minutes and the values for the U and Th being in %) the relative content of U and Th can be calcd. Fair agreement is shown between some values obtained by this method and those obtained for the same minerals by analysis. E. T. W.

Mineral deposits of the province of Tucuman, Argentine Rep. CARLOS DÍAS. *Informes dept. investigaciones ind. Univ. Tucuman* 1920, No. 11, 3–26.—There are no important deposits of metallic ores, except manganese. Building materials are abundant. L. E. GILSON

A method of constructing rock-analysis diagrams on a statistical basis. W. ALFRED RICHARDSON. *Mineralog. Mag.* 19, 130–6(1921).—A comparison of rock analyses is greatly simplified by means of the "variation diagrams" in which the % amts. of a constituent are plotted against the amt. of SiO_2 present. Variation curves constructed in this manner are useful in indicating, (a) the % of SiO_2 , (b) the % of another given constituent, (c) the variation of this constituent in rocks with the same SiO_2 content, and (d) the range of rocks with the same % of the given constituent. W. F. HUNT

Report of the committee on British petrographic nomenclature. W. W. WARRE, Chairman. *Mineralog. Mag.* 19, 137–47(1921).—The committee recommends the complete rejection of 27 names. No new names are proposed and the only obsolete name re-introduced is trachy-basalt, which is proposed in place of trachy-dolerite. W. F. HUNT

Rhombic porphyries occurring in the Pre-Cambrian Archean rock of Kebnekaise. PERCY QUENSEL. *Bull. Geol. Inst. Univ. Upsala* 16, 1–14(1919).—In the Tjäckta valley near the mountain of Kebnekaise, northern Sweden, Pre-Cambrian Archean rocks are found, as detd. by basal Silurian quartzite, which they carry. Regional metamorphism has taken place with less disintegration east of Kebnekaise, this, however, having increased westward, giving forth felsitic ultra-mylonite, which has the appearance of young volcanic rock. Where the lesser metamorphism has taken place as in the Tjäckta valley rhombic porphyries similar to those frequently found in the Kristiania region have been located. Rhombs of feldspar 1–2 cm. in length are embedded in a black rock consisting of the syenite porphyry usually encountered in the north of Sweden. Analysis shows feldspars to be of the K-Na type with some CaO, probably due to calcite incrustation. Optically, the feldspars measure 128° between (110) and (10); those of Kristiania measure between 127° and 135° , according to Brögger. The feldspars are microclinet-anti-perthites and the relations between K and Na differ very much, although the Na feldspar must be considered as the original, the K variety having formed around it. Microcline varies from 25 to 45%. This original Na feldspar is an oligoclase of the compn. Ab_2An_1 , though optical angles do not quite correspond to this chem. compn. Twin lamellation is strongly apparent, where microcline % is high, but almost disappears with this, the feldspar then resembling an orthoclase-microperthite containing albite. Similar perthitic rhombic feldspars were found by Warren in Quincy and Blue Hills, Mass. Feldspars run from 1.44 K_2O , 8.58 Na_2O and 3.56 CaO to 5.17 K_2O , 2.97 Na_2O and 4.66 CaO at Kebnekaise. Formation of feldspar rhombs in porphyry may be due to the growth of the feldspars along their sides; but they more probably have been formed by dissolution, this being proved by the rounded and ellipsoidal form of many individuals, also by the difference in compn. from the surrounding K syenites. This may also explain size of angle (110) : (10) as angles between faces of dissolution often vary considerably. Also the formation of K feldspar around the original Na feldspar in the rhombs is a sign that a disturbance in the formation of crystals has taken place, thereby indicating that the feldspar-rhombs and the

magma in which they are found have not cooled and crystd. simultaneously. The feldspars, on being surrounded by still fluid magma, have taken on rhombic aspect.

S. W. KIRSEBOM

Origin of the rhombic feldspars. NILS SUNDIUS. *Bull. Geol. Inst. Univ. Upsala* 16, 107-14 (1919); QURNSEL (preceding abstr.).—Q. claims that feldspars first formed are surrounded by a fluid magma, which dissolves the faces and gives them the rhombic form. S. holds this improbable. Rhombs are not formed by a secondary resorption but during a primary crystn. Eutectic points on Or:Ab as detd. by Vogt and Mäkinen do not correspond to the primary Na feldspar suggested by Q. Comparisons are made with specimens from Kristiania such as larvikite, which is a deep-seated product of crystn. almost entirely consisting of large rhombic feldspars. Idiomorphic form is not caused by resorption, but is probably due to viscosity of magma. Metasomatic changes have taken place in north of Sweden, but no great change in chem. compns. as claimed by Q.

S. W. KIRSEBOM

Secondary intrusive origin of Gulf coastal plain salt domes. W. G. MATTHESON. *Trans. Am. Inst. Mining Met. Eng.* 1921, No. 1048, 28 pp.—Previous theories of origin of the domes are critically reviewed, and their characteristics described, introductory to the presentation of the theory that they are of secondary intrusive origin. Hot saline satd. to supersatd. solns. or brines, accompanied by vast quantities of gas, ascending along lines of structural weakness, deposited the domal materials relatively near the surface. The initial period of movement and uplift, caused by the force of growing crystals and the increase in volume accompanying the conversion of limestone to gypsum, occurred contemporaneously with the formation of the domal materials and sedimentation, causing gradual uplift locally as the surrounding area was sinking. Erosion over a considerable time interval ensued, removing part or all of the sediments capping the domal materials and in some instances, portions of the domal material itself, to be followed by another period of sedimentation, deposition, and uplift, with several minor phases, during which time sufficient lateral thrust and compression were operative to cause gradual upward intrusion of the domal materials *en masse* into the overlying strata.

S. G. GORDON

The fibrous gypsum of Nottinghamshire. W. ALFRED RICHARDSON. *Mineralog. Mag.* 19, 77-95 (1920).—All the gypsum veins, which rarely exceed 3 in. in thickness, occur in marls and are of the "cross fiber" type. The surface of the walls separated from the vein shows no evidence of movement relative to the vein. A line of division (central parting) runs through the veins roughly parallel to the walls. These partings are marked by inclusions of marl, which may swell out into lenticles. Not infrequently the vertical fibers of gypsum are bent or broken at the central parting and show evidence of strain. It is thought that the veins were formed by a dehydration and contraction of the marls. The relief of pressure by rupture may have caused spontaneous crystn. at numerous closely spaced centers. The crystals, fed by vertically diffusing solns., grew vertically as long as contraction continued. When contraction ceased, growth was resisted and the stresses set up were transmitted to the central parting and produced the bending and other pressure effects noted.

W. F. HUNT

Determination of the composition of mineral waters (Silva) 14. Rotating-stage petrological microscope (RICHARDSON) 1. A refractometer for the determination of liquid mixtures (THOMAS, HALLIMOND) 1. Separation vessel for heavy solutions (LINCIO) 1.

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9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

Australian ore-dressing practice. A. MAXWELL HOWE. *Australasian Chem. Met.* 3, 27-30(1920).—The new State ore-dressing plant at Coolgardie, Western Australia, is described in detail. A study of W ore (scheelite) concn. is described. The recovery is approx. 70% from an ore containing about 3% of WO₃. JAS. O. HANDY

Cyanide treatment of an amalgamation tailing. JOHN GROSS. Bureau of Mines. *Rept. of Investigations* 1921, No. 2205.—The Alaska Sta. of the Bur. of Mines ran a test on tailings of an ore from a mine in the Fairbanks district to det. whether or not the tailing from amalgamation could be profitably treated. The original ore was highly oxidized. Concn. tests on tailings did not show a profit. The cyanation test showed that on a basis of 10 tons a day, an extn. of \$4.00 would result at cost \$1.80 per ton, leaving a profit of \$2.20 a ton. Flotation tests on slime from the same ore gave a concentrate of grade not high enough for shipment to smelter. It is concluded that if the ore blocked out in the mine shows that 3000 tons of \$40 ore can be mined and milled, the question of treating the amalgamation tailing should be considered. E. S. W.

Pyritic smelting of refractory sulfides in a Knudsen furnace. EDWARD H. ROBBE. *Eng. Mining J.* 111, 304-7(1921).—Pyritic, or semi-pyritic smelting of Cu ores, as carried out at Mount Lyell, Copperhill, Anyox, and Clarkdale is a partial soln. of the attempt to perform at once, or within the walls of one furnace, both the melting of the ore and the oxidation of the Fe and the S in the mat. In the above mentioned plants blast furnaces of the ordinary design, or with only minor modifications, are employed. At Sulitjelma, Norway, the Knudsen furnace (*C. A.* 3, 2928), an entirely different type of smelting furnace, has been used for several years. Its design is more like that of a converter than of a blast furnace. Its product is, however, not unlike that of the pyritic blast furnace. The action is not continuous but a saving of fuel is made. After a long series of unsuccessful attempts to apply the principles of pyritic smelting to the Cu-Ni ores of the Sudbury district, it was decided to send 200 tons of Sudbury ores to Sulitjelma for exptl. treatment. The results were so promising that a 50-ton Knudsen furnace of the type of the 20-ton Norwegian furnace was designed. The ore used for the Knudsen tests averaged 1.5% Cu, 4.1% Ni, 42% Fe, and 23% S, with 18 to 19% SiO₂. Theoretically such an ore should be capable of a high degree of pyritic smelting.

With a pure Cu ore the process was workable, but with Ni present all previous efforts had failed. The usual practice with such Cu-Ni ores is roasting in open heaps to 10 to 12% S and smelting the roasted ore with 11% of coke. The first few runs with the Knudsen furnace proved that this process could smelt this troublesome ore with less than 5% of fuel. The design of the furnace was modified by decreasing the length and increasing the width and height; this was more successful than the original design and enabled smelting with only 4% of fuel. Intermittent smelting and high slag loss went far to offset the advantage of low fuel costs and if the S content of the ore fell below 20% difficulty in smelting was experienced.

LOUIS JORDAN

The metallurgy of lead. ANON. *Rass. min. met. chim.* 54, 26-9(1921).—By careful control of the roasting furnace with regard to charging, admission of air, etc., it was possible greatly to decrease the coke required for this part of the process, the S of the ore being used as fuel. A portion of the S was left to be removed in the melting furnace by means of a suitable slag.

J. S. LAIRD

Roasting and lead-smelting practice at the Port Pirie plant of the Broken Hill Associated Smelters Proprietary, Ltd. GILBERT RIGG. *Bull. Inst. Mining Met.* 1920, No. 191, 1-3; cf. *C. A.* 14, 1286, 2606, 3210.—It is brought out in the discussion that slags produced by smelting zinciferous lead ores from Rhodesia Broken Hill mines often contain more than 20% ZnO. They also contain 40% or more Fe oxide, of which 6% or less is in ferric state. These slags may contain 18% SiO₂, 5-6% Al₂O₃ and 2.5-3.5% P₂O₅. The Fe₂O₃ is thought to be in the form of magnetite or franklinite and the Zn as Zn₂SiO₄, the latter corresponding to willemite. It is suggested that the phosphate content may have a marked effect in retaining Pb in the slags. H. C. PARISH

Theoretical principles underlying the metallurgy of zinc. E. JÄNECKE. *Metall u. Erz* 16, 247-51(1919).—If solid ZnO and C be added to molten Zn in a space from which the air has been exhausted, then at temps. above the m. p. of Zn an equil. will be established between the two solid phases and one liquid phase mentioned and a gaseous phase. It is a univariant equil., since the 4 phases may be formed from 3 independent components, and hence the pressure and compn. of the gas will be const. at a definite temp. and will vary with the temp. In applying the results of a theoretical discussion of the process to the technical process regard must be paid to the slowness of the reaction between two solid substances which, even at high temps. have only a small vapor pressure. By increasing the velocity of the reaction improvements in the smelting process might be effected.

J. S. C. I.

The regenerator of the Siemens-Martin furnace. HUBERT HERMANN. *Feuerungstechnik* 9, 24-6, 29-31(1920).—A general consideration of the importance and operation of the Siemens-Martin regenerator.

H. C. PARISH

Ferromanganese as a deoxidizing agent. A. JUNG. *Stahl u. Eisen* 39, 14-5(1919).—The statement that the addition of Fe-Mn to steel in the converter in the presence of retained slag hinders the re-phosphorizing of the metal is not quite correct. In a series of tests carried out on an iron contg. 3% P a relatively large proportion of preheated solid Fe-Mn was added to the converter. The slag contained 20-4% P₂O₅, and the lining of the converter was badly attacked. The P content of the metal in the converter increased by 0.01% P in the 5-7 min. which elapsed from the taking of the last dip sample until the Fe-Mn had melted, and by 0.025% P from that point until the final sample was taken in the middle of pouring. By using the normal quantity of Fe-Mn, a more resistant lining in the converter, and a lower temp. during the pouring, less P was taken up. Even when the Fe-Mn was added in the liquid state, and the metal carefully skimmed, equally high results were obtained.

J. S. C. I.

A proposed new ingot mold of steel. R. C. WOODWARD. *Iron Age* 107, 262-3(1921).—The use is described of a thin-walled ingot mold made from steel, which is chilled by a spray of water from a coil surrounding it. The use of this mold increases the

thickness of the solid skin of metal next to the wall of the mold. The tendency for cracks to be formed by the molten metal piercing this skin is, therefore, reduced.

F. P. FLAGG

Cooling of highly heated iron objects. F. RIEDEL. *Stahl u. Eisen* 40, 1-9(1920).—Formulas have been devised for calcg. the rate of cooling of highly heated Fe objects by radiation and by conduction. Results of expts. on heat radiation were in fair agreement with the calcd. results. The temp. distribution in the interior of the Fe bodies during cooling is also discussed, and the results of some expts. are given. J. S. C. I.

The founding of bronze. CHAS. VICKERS. *Brass World* 17, 87-90(1921).—A detailed, illus. review. C. G. F.

Specification for cupola semi-steel. Y. A. DYER. *Iron Age* 107, 9-10, 104(1921).—D. submits specifications for semi-steel castings which he recommends that the Am. Foundrymen's Assoc. should consider adopting. He outlines the procedure used to manuf. semi-steel in the cupola. F. P. FLAGG

Stages in the recrystallization of aluminium sheet on heating—with a note on the birth of crystals in strained metals and alloys. H. C. H. CARPENTER AND CONSTANCE F. ELAM. *J. Inst. Metals* 1921, adv. copy No. 1, 22 pp.—The investigation was designed to det. what structural changes accompany the gradual softening of Al on heating. The expts. were carried out with Al sheet containing 99.6% Al. Previous investigators polished sections corresponding to the surface of the sheet; the authors have used cross-sections in all their work. Photomicrographs are given showing all the results. There are three distinct types of structure produced which correspond to different steps in the passage from the work-hardened amorphous cryst. complex to the fully softened cryst. sheet. Type 1, is produced by heating for long periods at 220° and short periods at 250 and 300°. It is the first visible structural change and is characterized by the general tarnishing of the surface, a granular structure, and a blurring of the original boundaries of the flattened crystals. Type 2, is the birth of new crystals in the old boundaries. These appear white in contrast with the tarnished unoriented old crystals. This type is produced in the early stages of recrystn. at 250 and 300°. Type 3, is the structure obtained after heating to structural equil. at a given temp. and appears in two forms: (a) The crystals are very much elongated in the original direction of rolling and some of them darken on etching. Prolonged heating at 250 or 300° produces this sub-class. (b) The crystals are more nearly equiaxed the higher the temp. but even at the highest temp. show slight elongation in the direction of rolling. Examples; specimens heated at 450 to 600°. Heating at 350 to 400° first produces markedly elongated crystals like class (a) and finally crystals resembling class (b). *Note on birth of crystals.*—In a recent paper on "Crystal growth and recrystn. in metals" (C. A. 14, 3391), the authors stated that the recrystn. of the strained metals examined by them did not take place as a result of general disintegration of the distorted crystals, but that new crystals were formed only on the boundaries of the old ones and grew from there into the crystals themselves. To amplify the evidence of the above expts. with Al, the authors made expts. with 82Al-18Zn and with 70:30 brass which confirmed their views. F. W. COBB

Annealing steel castings with fuel oil. R. R. HILLMAN. *Iron Age* 107, 247-9(1921).—H. describes the construction and operation of an oil-fired annealing furnace adopted by the Atlas Steel Casting Co. and used to anneal a charge of about 25 tons of steel castings. F. P. FLAGG

Calorizing as a protection for metals. A. V. FARR. *Iron Age* 107, 251-3(1921).—F. describes the calorizing process and the properties of calorized metals used to resist oxidation at high temps. Also in *Iron Trade Rev.* 68, 1724-7(1921). F. P. FLAGG

The distribution of hardness in quenched carbon steels, and quenching cracks. KÔTARÔ HONDA AND SAKAÛ ICHI. *Sci. Repts. Tôhoku Imp. Univ.* 9, 491-507(1920).—

It is assumed that the A_1 transformation consists of the compound transformation austenite \rightarrow martensite \rightarrow pearlite. During the quenching austenite is for the most part changed into martensite, but the further change of the martensite into troosite is arrested. Hence in a quenched steel, a certain amt. of austenite is always present intermingled in martensite. The amt. of this austenite increases as the quenching temp. increases. In small pieces of steel, such as a square or a short cylinder, the periphery is harder than the central portion only when the quenching is very soft. In a moderate quenching, the hardness is everywhere nearly equal; but in a hard quenching, the periphery is always softer than the interior. This anomalous phenomenon is explained by the presence of the arrested austenite in martensite. The quenching cracks in small pieces of steel occur when the hardness in the central portion is much greater than in the periphery. The cause of the cracking is attributed to the stress caused by the difference in the sp. vols. of austenite and martensite; the sp. vol. of the former structure being much smaller than that of the latter, the central portion exerts a larger tangential tension on the periphery, causing thereby the cracking of the specimen. Since the difference in the sp. vols. increases as the temp. falls, the cracking usually takes place when the temp. of the quenched specimen approaches room temp. In a hard quenching, the hardness generally increases with the lapse of time, owing to a gradual transformation of the arrested austenite into martensite. In the case of a large piece of steel the explanation of the cause of cracking previously given (C. A. 14, 3629) will be true; but in the case of small pieces it evidently does not apply.

F. P. PHELPS

Chemical equilibrium between iron, carbon and oxygen. A. MATSUBARA. *Trans. Am. Inst. Mining Met. Eng.* 1921, No. 1051, 52 pp.—A detailed report on an extended research on (1) the equil. compn. of the gas phase in the system CO, CO₂, and Fe (containing 2 to 30% O) at the temps. 873, 1070, and 1175°; (2) the equil. compn. of the gas phase in the systems (a) CO, CO₂, FeO (satt. with Fe), and Fe (satt. with FeO) and (b) CO, CO₂, Fe₃O₄ (satt. with FeO), and FeO (satt. with Fe₃O₄) at several temps. above 700°; (3) the equil. compn. of the gas phase of the systems (a) FeO, Fe₃C, CO, and CO₂ and (b) Fe, Fe₃C, CO, and CO₂ in the range 700–1100°. The sp. reactions considered are (A) $3 \text{ Fe}_2\text{O}_3 + \text{CO} \rightleftharpoons 2 \text{ Fe}_3\text{O}_4 + \text{CO}_2$; (B) $\text{Fe}_3\text{O}_4 + \text{CO} \rightleftharpoons 3 \text{ FeO} + \text{CO}_2$; (C) $\text{FeO} + \text{CO} \rightleftharpoons \text{Fe} + \text{CO}_2$; (D) $2 \text{ CO} \rightleftharpoons \text{C} + \text{CO}_2$; (E) $3 \text{ Fe} + 2 \text{ CO} \rightleftharpoons \text{Fe}_3\text{C} + \text{CO}_2$; (F) $3 \text{ FeO} + 5 \text{ CO} \rightleftharpoons \text{Fe}_3\text{C} + 4 \text{ CO}_2$. Pure CO was admitted to a porcelain tube contg. a sample of Fe₃O₄ heated to a definite temp. After equil. was attained the gas phase was withdrawn and analyzed and the boat contg. the partially reduced Fe₃O₄ was weighed to check the amt. of O remaining in the solid phase. This procedure was repeated until the O in the solid phase was reduced to about 2%. To make sure of the reversibility of the reactions concerned, an already reduced solid phase (Fe-FeO) was oxidized by successive charges of CO₂. These values agreed with those obtained by reduction with CO. The equil. pressures within the range 561–1175° for reactions (B) and (C) when each system contains amorphous C are calcd. from the exptl. values for the compn. of the gas phase. The dissociation pressures for FeO and Fe₃O₄ are also calcd. When, by successive reductions with CO, the O in the solid phase of the systems considered above is decreased to a small quantity a new reaction begins and the solid phase contains, besides O, some combined C. The reaction of carburization takes place according to (E) or (F). From detns. of the equil. constns. for (E) and (F) it is concluded that the first period of carburizing reaction coincides with (F) and at a later period with (E); that there exist transient equilibria between the above two, between the first and reaction (C) and between the second and (D); equilibria at lower temp. occur with a more oxidized form of the solid phase than at higher temp. even in the same carburizing reaction. The limits of temp. and pressure for carburization are detd. from the exptl. data. Above 1300° the carburizing

action of CO does not occur; carburized Fe is oxidized to FeO-Fe solid soln. by pure CO at 1 atm. pressure. Under 1 atm. pressure, at 1200° neither carburization nor decarburization occurs in pure CO; between 1200 and 1300°, C-bearing Fe is decarburized by pure CO, but O-bearing Fe may be carburized by the same gas, both reactions ending in the formation of O-bearing carboniferous Fe proper to that temp.; between 695 and 1200° a gas sufficiently rich in CO will carburize Fe; below 695° no carburization in the ordinary sense can occur. The carburization theory is applied to the practice of casehardening, the making of malleable castings, and to the explanation of a blast-furnace diagram and the problem of quick smelting. LOUIS JORDAN

The crystalline nature of graphite and temper-carbon obtained from cast iron. KŌJI IOKIBÉ. *Sci. Repts. Tōhoku Imp. Univ.* 9, 275-279(1920).—The two kinds of C, graphite and temper-carbon, occurring in cast Fe are sometimes assumed to be different forms, i. e., cryst. and amorphous. In order to det. if this is true samples of each were prepd., the graphite C being prepd. electrolytically from gray pig Fe and the temper-carbon from annealed white cast Fe by digesting in boiling HNO₃. The Fe(NO₃)₃ soln. was removed by filtration and the remaining C washed with hot dil. HCl and warm H₂O until there remained no traces of iron. The two kinds of carbon in the form of powder were compressed into cylindrical rods and together with natural graphite were examd. by X-rays using the method of P. Debye and A. W. Hull. The radiograms obtained show that the so-called graphitic C and the temper-carbon as found in cast Fe are both the same substance as natural graphite. F. P. PHELPS

The state of carbide in carbon steels quenched and tempered. SEIZŌ SAITŌ. *Sci. Repts. Tōhoku Imp. Univ.* 9, 281-7(1920).—A new attempt is made to solve, by means of a magnetic analysis, the question whether or not troostite contains free cementite. The results are summarized as follows: From the point of view of X-ray analysis we may say that C dissolves in Fe as C atoms or as cementite, meaning thereby the same at. configuration. By tempering a quenched steel at about 300° cementite is first set free; but owing to the fineness of the particles the greater part of it readily decomposes into Fe and C. Free cementite corresponding to the change from sorbite to pearlite, i. e., a coagulated cementite of comparatively large grain does not decompose in any appreciable degree at high temps., below the A₁ point. In hypereutectoid steels above the A_{c1} point there exists some free cementite, which is partially decompd. at these high temps. into Fe and C. Free C when dissolved in Fe at high temps. combines with Fe to form cementite, and during cooling is set free as combined C. F. P. PHELPS

The equilibrium diagram of carbon-manganese alloys. KIYOSI KIDO. *Sci. Repts. Tōhoku Imp. Univ.* 9, 305-10(1920).—Stadeler's equil. diagram of Mn-C alloys has been modified and completed. In the alloys a compd., Mn₃C, is formed. In the liquid state the carbide and Mn are sol. in all proportions; but in the solid state they are only partially sol. in each other. As the temp. decreases the soly. of both decreases and at about 920° they form a eutectoid, being nearly insol. below that temp. F. P. PHELPS

Ternary alloys and the coefficients of equivalence. LEON GUILLET and ALBERT PORTAVIN. *Rev. metal.* 17, 561-7(1920).—A mathematical and theoretical paper on the effect produced on the structure of a binary alloy due to the addition of a third constituent. The metal added may enter into solid soln., may form a compd., as is the case with P in brass, or may remain intact, as Pb in brass. The first class is most important, especially when the constituents of the original binary alloy are not completely miscible in the solid. The addition of a third metal may displace the eutectoid or transformation points vertically, as is noticed with alloy steels or the Cu-Al-Zn alloys described by Carpenter, or horizontally. The coeff. of equivalence is that proportion of an element which replaces 1% of either constituent of the binary alloy. G. and P. use

the formula $A' = [100a/100 + q(t-1)]$, where A = new limits of α and β , A' = limits of α and β in brass, q = amt. of element added, $(100 - A)$, and t = coeff. of equivalence, as applied the calcn. of the α and β limits of Cu-Zn-Al diagram from the known values of the brasses. They obtain 91.2%-87.1%, which is substantiated by metallographic methods. Expressing α and β as $\alpha/\beta = K$; two types of metals are noted; those which increase α/β (Ni, Co, Mn, Fe) and those which decrease α/β (Al, Si, Sn). The coeff. of equivalence does not definitely define properties of alloys but serves as a guide in interpreting them. The theory is also applied to other ternary alloys. The paper is well illustrated. W. A. MUDG

Heusler's alloys. II. Magnetic measurements of aluminium manganese bronzes containing high percentages of iron. O. v. AUWERS. *Ann. Physik* 63, 867-99(1920); cf. C. A. 14, 2609.—A. gives detailed discussion of relative merits of DuBois' and Töbusch's methods and app. The former is suitable only for alloys of high permeability and gives high results for alloys of low permeability especially with low field strengths. He adopts T.'s app. (*Ann. Physik* 26, 439(1908)) with slight modifications, claiming greater sensitiveness and freedom from disturbances. The effect of the magnetic field of the coil should not be neglected in the calcn. of results. The equation for the app. is derived and checked by exptl. data. Additions of 13.5-18.1% Fe to Al-Mn-Cu alloys containing 7.7-10.4% Al and 17.0-18.7% Mn do not appreciably affect the magnetic properties of the bronzes. In view of his results A. suggests a greater effect than heretofore supposed is due to the Mn. The magnetic properties of the alloys generally increase with decreasing temp.; one exception is noted. Complete metallographic data will be required for final soln. of the problem. Several tables and curves give the complete exptl. results. W. A. MUDG

Plastic deformation of some copper alloys at elevated temperatures. C. A. EDWARDS AND A. M. HERBERT. *J. Inst. Metals* 1921, adv. copy, No. 3, 25 pp.; cf. C. A. 12, 2521.—The authors used the instrument designed by Willis and Edwards for making indentation tests under dynamic stresses. The advantages of using this app. and dynamic instead of static stresses are: (a) It is possible to make a considerable number of tests on the same specimen with rising and falling temps. without otherwise altering conditions. (b) The time factor is reduced to a minimum. (c) The conditions of the indenting tool are kept constant. Tests were made on 6 Cu-Zn alloys and 6 Cu-Al alloys with falling temps. and on one Cu-Zn alloy with rising temps. Expts. show a marked change in plasticity which occurs at about 450° in all Cu-Zn alloys containing more than 36% Zn. This is associated with the β constituent which has a thermal critical point at 470°. A similar change in plasticity occurs at 550° with the Cu-Al alloys. The characteristic features of the curves for both alloys are the same and in the Cu-Al series the discontinuity is caused by the $\beta \rightleftharpoons \alpha + \gamma$ transformation. These results are very different from those obtained by Rosenhain and Huntington for Cu-Al alloys and by Bengough in his elaborate work on Cu-Zn alloys. These men found clear indication of an alteration in mechanical properties at temps. below those at which known constitutional changes take place. The authors compare their own method with the tension method at length, laying particular stress on the difference in the time factor, but do not consider the differences in method sufficient alone to account for the fundamental differences in results. F. W. COBB

The season-cracking of brass and other copper alloys. H. MOORE, S. BRCKINSALE AND C. E. MALLISON. *J. Inst. Metals* 1921, adv. copy, No. 5, 91 pp.—The authors have studied this problem during several years. They describe in the first section the examn. of large numbers of *season-cracked articles*. In the second section they report the *action of corrosive and other substances on stressed brass*. Brass samples taken from a very uniform lot of metal and given treatment which left internal strains of varying amt. in the specimens were exposed separately by immersion in solns. of NH_4OH , NH_4NO_3 ,

NaCl, niter cake, $\text{Zn}(\text{NO}_3)_2$, $\text{Cu}(\text{NO}_3)_2$, and by confinement in a closed space to the fumes from HNO_3 , HCl , fuming H_2SO_4 in presence of H_2O vapor and liquid N_2O_4 for intervals varying from 70 days to 2 yrs. Some annealed specimens were exposed to the same conditions. Only those specimens which had internal strains and were immersed in NH_4OH and NH_4NO_3 solns. cracked, although many others were badly corroded. Strained specimens exposed for 2 yrs. to atm. in a ventilated room did not crack. All strained specimens remaining uncracked after the above treatment cracked upon immersion in HgNO_3 soln. Pickling reduces stresses but does not completely relieve them. In the third section the authors report the results of the study of the action of Hg and of NH_4OH on brass and the *use of Hg for the detection of stress*. The action of Hg is as follows: Hg is deposited on the surface of the brass and forms a weak alloy. The surface layer in tension weakened at the crystal boundaries develops intercryst. cracks, which extend so long as sufficient tension exists at the end of the crack and Hg is available to continue its action. The Hg deposited on the surface penetrates only a short distance and the observed loss of Hg from coated specimens left exposed to the atm. is not due to diffusion but to volatilization of the surface film. The action of NH_4OH is similar to that of Hg but extends to a greater depth. NH_4OH weakens the intercryst. material in unstressed brass and causes an actual separation of the crystals. The authors believe that their work supports the hypothesis that intercryst. material with properties different from those of the crystals it surrounds, is attacked more readily by NH_4OH and Hg , the former probably forming a chem. compd. possibly of the nature of a cupramine and the latter forming an alloy. The thickness of the amorphous surface film and of the much distorted crystal structure, containing a high % of amorphous material, directly beneath it, in cold-worked articles increases the time necessary for Hg or NH_4OH to reach a crystal boundary and start a crack. This explains the more rapid formation of cracks after the surface layer has been removed by pickling. The more severe the cold work, the less should be the selective action at the crystal boundaries because the amorphous phase is more uniformly distributed throughout the crystals. This explains the observation that the effect of Hg and NH_4OH in producing a crack in stressed brass becomes less the greater the hardness induced by cold work. In the fourth section the authors report the *influence of compn. on season-cracking*. Stressed alloys with less than 6% Zn do not crack on treatment with NH_4OH or Hg . Above 6% the greater the Zn content the more readily do cracks form. Mn does not affect the formation of season cracks. Stressed phosphor-bronze cracks under NH_4OH or Hg treatment but season cracks developing in service have not been observed. In the fifth section the authors report miscellaneous information. They found that no other surface injury than that induced by chem. action will cause the formation of a season-crack; that a continuous coating of Ni seems to be the only protective coating which will prevent the formation of season-cracks; that a blow-pipe flame impinged on stressed brass will cause a season-crack to form; that reeling removes internal stresses; and that protracted heating of stressed brass at 100° does not produce season-cracks nor relieve the stress appreciably. In the appendix the various test procedures used in the work are described. The HgNO_3 soln. used was made as follows: 1 g. $\text{HgNO}_3 \cdot 2\text{H}_2\text{O}$ crystals and 1 cc. HNO_3 (d.1.42) in 100 cc. of soln. Also in *Chem. Met. Eng.* 24, 796-80(1921). F. P. FLAGG

The constitution of the alloys of copper with tin. J. L. HAUGHTON. *J. Inst. Metals* 1921, adv. copy, No. 6, 22 pp.; cf. C. A. 9, 1597. III.—The author studied the equil. diagram of Cu-Sn alloys containing 30-100% Sn at temps. below 250° by thermal curves and electrical resistance measurements. The alloy with 30.5% Sn shows no arrest between 150° and 250° . The alloy with 42.8% Sn shows a small arrest at about 190° . The alloy containing 57% Sn shows a greater arrest at 190° and in addition a slight arrest at about 210° . These two arrests are present in alloys con-

taining 59% and 61% Sn. At 63% Sn the 190° arrest is pronounced and the 210° point has vanished and a new one has taken its place at 226°. As Sn increases the size of the higher arrest increases and the size of the lower arrest decreases, being barely perceptible at 90% Sn. The 210° arrest is not affected by the rate of heating whereas on rapid heating the 190° arrest will not show. After the 190° arrest has been suppressed, slow heating or cooling curves do not again show it until the sample has been annealed. Repeated heating and cooling at a slow rate bring about the disappearance of the 190° arrest from heating curves although it persists on the cooling curve. Electrical resistance measurements confirmed the presence of the 190° and 210° arrests. The arrest at 190° is caused by an allotropic change in the ϵ constituent. The arrest at 226° is due to the solidification of the eutectic of the constituents ϵ and ζ . The latter is a dilute solid soln. of Cu in Sn. The author cannot explain the cause for the appearance of the 210° arrest. Therefore, in the equil. diagram it is shown as a dotted line between 38 and 61% Sn. IV. H. studied the equil. curve between 99 and 100% Sn. He found that the solubility of Cu falls off slightly with increasing Sn content but that the slope of the curve is too small to show in the equil. diagram. In an appendix the author discusses the diagrams for Cu-Sn alloys suggested by other workers.

F. P. FLAGG

The utilization of zinc-aluminium-copper alloys. PENNLETON POWELL. *Brass World* 17, 100-1(1921).—A compilation based largely on the researches of Guertler, Czochralski, and Lohrke. C. G. F.

The binary system lead-bismuth. W. HEROLD. *Z. anorg. allgem. Chem.* 112, 131-54(1920).—The limits of the eutectic range in the Pb-Bi alloys have been detd. by different observers, generally by thermal methods, with divergent results. These limits have now been investigated by studying the elec. cond. and hardness of the alloys and their microscopic structure. Special precautions were taken to obtain uniform specimens by careful annealing. The cond. expts., which were made at 123° and 0°, indicated for the limit of soly. of Bi in Pb, 17.5 to 18.5% Bi, and for the soly. of Pb in Bi, 1.6% Pb. The interpretation of the results of the hardness expts. was uncertain, owing to the influence of the treatment which any particular sample had undergone on its hardness. The hardness-compn. curve had a wave-form with an inflection corresponding approx. with the eutectic point. The hardness of the eutectic does not appear to derive additively from that of the two series of mixed crystals. The curve indicates the mixed crystal limit on the Pb side at about 17-18% Bi. The microscopic expts. showed that a sample containing 40% Bi contained no trace of eutectic after annealing 8 hrs. at 124°. Alloys with more than 40% Bi showed eutectic after 30 hrs. at 40°. It is concluded that the two limits for the eutectic are 40% Bi and 0.2-0.5% Pb. J. C. S.

The action of reducing gases on heated copper. H. MOORE AND S. BECKENSALE. *J. Inst. Metals* 1921, adv. copy, No. 4, 22 pp.—The authors confirm the results of many workers that the injurious effects produced by heating Cu in reducing gases are the result of their interaction with Cu_2O , always present in com. Cu. They suggest that the majority of cracks observed in specimens of Cu heated in reducing gases are intercryst. because during the heating the crystals have grown until they reach the cracks where growth must stop. They recommend that Cu be deoxidized preferably with Zn, which need not be present in excess of 0.10% to furnish complete protection. F. P. FLAGG

Blue brittleness in certain steel welds. CHARLES FRÉMONT. *Compt. rend.* 172, 368-70(1921).—Poor phys. properties of steel welds are generally due to oxidation and the failure to remove oxidized metal from the weld before solidification. Proper elec. welding gives best results. When making elec. mild steel welds F. obtained several fractures, always at the same distance from the weld itself and in that part of the metal which would be heated to a blue color, 200-450°, during the welding operation. This

defect is not a common property of elec. welded steel and can be eliminated by a proper selection of the kind of steel, by having a large pool of molten metal and sufficient tension to expel all oxidized metal from the weld before solidification. Also in *Engineering* III, 729-32(1921).

W. A. MUDGE

Properties of resistor materials used for heating purposes. H. O. SWOBODA. *Elec. World* 77, 944-5(1921).—A detailed tabulation of all the important physical properties of 28 different metals and alloys used as elec. resistors.

C. G. F.

Metallurgical use of pulverized fuel (HERINGTON) 21. High-speed radiography and radio-metallography (THORNE-BAKER, LEVY) 5. New cutting gas (ANON.) 21. The saturation value of magnetization of cementite (SARRÓ) 2.

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WHITE, BENJAMIN: *Gold*. New York: Isaac Pitman & Sons Co. 130 pp. \$1. For review see *Eng. Mining J.* 111, 634(1921).

Ore-concentrating apparatus. R. LUCKENBACH. U. S. 1,370,601, Mar. 8.

Flotation agents. JOS. H. JAMES. Can. 210,808, Apr. 19, 1921. The partial oxidation products of mineral oils such as petroleum containing naphthenes or aldehyde fatty acids are used for forming froth in concg. ores.

Sintering ores, gravel, etc. C. GIESCKE. Brit. 156,183, Jan. 3, 1921. In a process for obtaining sintered balls or lumps from mixts. of fine ore, flue dust, waste-gravel, grit, or the like, with fine fuel such as coke dust, the mixt. is supplied with enough H₂O for treatment in an extrusion press, and the extruded wet masses are rapidly heated in a shaft furnace to sintering temp.

Smelting ores, etc.; furnaces. U. A. GARRED. Brit. 154,240, Aug. 9, 1918. In a process for smelting ores, melting metals, etc. the ore or metal, with or without admixed fuel, is fed downwards through the vertical shaft of a furnace into an enlarged chamber in which it spreads out leaving a free space to serve as a combustion space, and air under pressure and powdered fuel are injected through tuyères into the space, where combustion takes place. The products of combustion pass up through the descending charge. A relief valve may be provided to control the pressure in the combustion space.

Extracting metals. E. A. ASHCROFT. Brit. 156,866, Sept. 30, 1919. Metal-bearing ores or materials, particularly sulfide ores, are treated to form chlorides of the metals, Fe and Mn, if present, being sepd. as oxides, and the metals are fractionally pptd. by means of alloys of Pb or Zn with Mg, Ca, Na or K, the latter being reformed by electrolyzing the resulting chlorides, using cathodes of the heavy metals. A suitable app. is specified.

Recovering mercury. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,187, Jan. 3, 1921. Metallic Hg is recovered from mixts. such as spent catalytic material comprizing Hg, Hg salts, and org. material, by heating the material to 200–300° for some hrs. with a reducing metal, particularly Fe powder.

Extraction of lead from sulfide ores. WM. H. HANNAY. Can. 210,188, Apr. 5, 1921. Pb is extd. from its sulfide ores by grinding the ores in a neutral brine, leaching with FeCl_3 to dissolve the PbS and electrolyzing the soln. to deposit the Pb and regenerate the FeCl_3 .

Extraction of zinc. FRED. E. LEE. Can. 210,189, Apr. 5, 1921. Zn is extd. from ores, concentrates, etc. by oxidizing the Zn content, dissolving the sol. Zn in dil. H_2SO_4 , heating the residue in a sulfating atm. to convert the Zn into sol. compds. and then extg. the Zn. The Zn is removed from the soln. by electrolysis.

Extracting Zn from ores. FREDERICK LAIST. Can. 210,185, Apr. 5, 1921. Zn ores are leached with dil. H_2SO_4 in quantity insufficient for complete extn. of the Zn, the resulting ZnSO_4 soln. is sepd. from the residue and the residue subjected to a second leach with dil. H_2SO_4 . The ZnSO_4 soln. is electrolyzed with insol. anodes and the resulting soln. is used in the leaching operations.

Obtaining gold and silver from solutions of the double alkali cyanides. HORACE FREEMAN. Can. 210,070, Apr. 5, 1921. Au and Ag are extd. from cyanide solns. by treating the solns. with metallic Na alloyed or mixed with metallic Pb.

Preparing fine ores for sintering. FREDERICK A. EUSTIS. Can. 209,199, Mar. 8, 1921. Fine ore is formed into a filter cake and finely divided particles of fuel are stuck to the outside surface of the cake. The cake may then be divided into pieces of suitable size to make a porous sintering charge.

Process and apparatus for sintering. FREDERICK A. EUSTIS. Can. 210,870, Apr. 26, 1921. Charges of fine material are successively sintered and the heat generated by the sintering of the several charges is utilized for heating the charges succeeding them respectively.

Purifying blast-furnace gases. DINGLER'SCHE MASCHINENFABRIK AKT.-GES. Brit. 156,754, Jan. 7, 1921. In order to preheat the gas in connection with a dry purifying plant, a portion of the raw gas or of the cleansed gas is burned and the heat thus produced is utilized for preheating, regulation being effected either by controlling the quantity of gas burned or by addition of air or inert gas to the gases of combustion or both. Preferably two independent heating chambers are employed, one for preheating the raw gas and the other for preheating the gas used for cleansing the filter of the purifier.

Device for the combustion of poisonous gases in high furnaces. J. VORHILL. U. S. 1,371,827, Mar. 15. The app. is adapted for rendering smelter stack gases less noxious.

Iron manufacture. H. KOPFERS. Brit. 156,643, Jan. 6, 1921. In the operation of smelting and reducing furnaces more particularly iron-smelting blast furnaces, a substantially const. level of slag is maintained on the hearth so that the reactions occurring therein proceed uninterruptedly. For this purpose, a slag overflow and a connected siphon for the molten metal are provided, through which the slag and metal, resp., flow into an adjacent container, which may be separately heated and from which intermittent delivery is effected in the ordinary way. The overflow is of a section

large enough to allow the passage of hot gas to equalize pressure and keep the passage clear. A throttle outlet controls the quantity of gas passing. With the arrangement described, *manganese-iron alloy* can be made by introducing the Mn into the slag in liquid form as a silicate, the reduction of the Mn readily taking place in the hearth.

Iron manufacture; furnaces. H. KOPPERS. Brit. 156,644, Jan. 6, 1921. The use of inferior Fe and scrap in a cupola furnace is rendered possible by maintaining a const. level of slag and molten Fe in the hearth, this being effected by the use of a slag overflow and a connected siphon for the removal of the metal, which latter flows through a liquid seal into a container. Some of the hot gases from the cupola pass through the slag outlet and are employed to heat the container, which may take the form of an open-hearth furnace with regenerators for the air supply.

Iron and steel manufacture. H. C. SCHURZ. Brit. 156,548, Jan. 5, 1921. In a process for removing C from Fe and other metals or alloys by means of O, the admission of O is regulated in such a manner that only so much metal oxide is formed as can again be reduced by the active C present; so that oxidation and reduction take place at practically the same rate and at the same time. The bath in which the operation takes place is externally heated and maintained at a temp. not exceeding the m.p. of the metal or alloy under treatment. The O is admitted by means of inclined nozzles of small cross-section so that the bath is given a circulating movement by the action of the impinging gases which may also heat the bath. The O may be used in the pure state, or as air with or without admixt. with O or other gases such as combustion gases or in the form of oxides. In this way the C is removed without any appreciable loss of substances such as Mn, Cr, Si, etc.

Iron and steel manufacture; furnaces. H. KOPPERS. Brit. 156,765, Jan. 7, 1921. In a process for operating smelting and reducing furnaces, more particularly blast furnaces, a portion of the hot gases is withdrawn just above the tuyère level, is cooled, and re-introduced into the furnace at a higher level, the temp. of the gases being thus reduced from 1400° to approx. 800°. The heat obtained from the gases may be used in a steam generator or for preheating or drying the charge.

Iron and steel. E. RIVEROLL. U. S. 1,370,915, Mar. 8. Fe ore is subjected to the action of a reducing and carburizing gas such as a hydrocarbon gas at a temp. sufficient to reduce a portion of the Fe of the ore to metallic condition to form sponge Fe while leaving another portion of the Fe unreduced, and to carburize the sponge Fe. The partially reduced mixt. is subsequently heated to effect reduction of the residual ore by interaction with the carburized Fe sponge.

Wrought iron. J. ASTON. U. S. 1,370,507, Mar. 8. A large wrought-Fe ball or mass is formed from a substantially slagless product of a steel-making process, and the mass is squeezed and rolled directly into slab or billet form.

Wrought iron. J. ASTON. U. S. 1,370,622, Mar. 8. The product of a steel-making process is comminuted or granulated while molten, and the hot granules, as formed, are dropped into a bath of Fe silicate slag within a shaping receptacle and allowed to come into contact with each other at a welding temp. below the surface of the slag to form a coherent mass or sponge of mixed metal and slag which is rolled to form bars or billets.

Wrought iron. JAS. ASTON. Can. 210,718, Apr. 19, 1921. In making wrought Fe the preheated granulated product of a steel-making operation is fed into a bath of puddling slag which is at or above a welding temp. and a bath is formed therein.

Manufacture of wrought iron. JAS. ASTON. Can. 211,012, Apr. 26, 1921. Wrought Fe is produced by granulating the molten, substantially slagless product of a steel-making process, mixing the granulated product with a molten slag of proper puddling characteristics and forming under the surface of the bath a mass of mixed

metal and slag. The mass is then squeezed or pressed and the slab or billet rolled into the desired product.

Coating iron or steel with lead. R. J. SHOEMAKER. U. S. 1,371,445, Mar. 15. Fe or steel articles to be coated with Pb are treated with a soln. of Pb acetate of at least 35% strength at a temp. of about 75° to form a film of Pb on the articles and the latter are then washed to remove Fe acetate.

Acid-resistant alloys. FOSTER MILLIKEN. Can. 210,800, Apr. 19, 1921. An alloy resistant to weak acids contains Cu 42-52%, Ni 22-28, Pb 22-30.

Alloys. F. P. TREATOR. Brit. 156,426, Feb. 11, 1920. Alloys for filling in defects in castings, particularly internal-combustion engine cylinders, consist of about 40-45% of Pb, 12-15% of Sb, 34-40% of Sn, and 6-11% of Cu. Sep. alloys are first made of the Pb, Sb, and a small part of the Sn, and of the Cu and the remainder of the Sn, and the two alloys so produced are made into the final alloy. The alloy may be applied to the casting in the manner described in 156,999 or by cleaning the cavity mechanically and chemically, running in the alloy with a flux, and working it with a Cu bit and a hot flame. An alloy comprizing 5-45% of Pb, 10-25% of Sb, 30-70% of Sn and 15-40% of Cu, with traces of Fe, also is referred to.

Alloys. W. H. KELLER. Brit. 156,193, Jan. 3, 1921. Fe-Si alloys having an elec. resistance higher than Fe and capable of being punched, particularly for making resistance grids, etc., contain 1-6% of Si and 0.2-1% of Mn, with or without 0.1-0.25% of C. Increase or decrease in the proportion of Si is accompanied by increase or decrease in the proportion of Mn.

Alloys. R. WALTER. Brit. 156,561, May 4, 1920. Ferro-chromium and like alloys containing Si, *e. g.*, 13-25%, contain also over 0.65% of C, *e. g.*, 0.8-1%. Solidification is effected at a temp. as near the m.p. as possible with a view to ensuring that the C shall be mainly in graphitic form.

Alloys. R. WALTER. Brit. 157,054, May 4, 1920. Alloys of metals of the Fe and Cr groups with Si are made to consist wholly or mainly of a homogeneous silicide and eutectic mixt. *E. g.*, an alloy corresponding to the formula Fe₃Si may be made by the exothermic reaction of 780 parts of Fe and 220 parts of 90% ferrosilicon. The formation of alloys containing Mg, Ni, Co, Cr, and W is referred to.

Alloys. W. MATHESIUS. Brit. 156,552, Jan. 5, 1921. A Pb alloy suitable for bearings contains about 3% of Ca and either about 1% each of Sr and Ba or about 1/4% of Ba. A lead alloy containing about 3% of Ca and about 1/4% of Cd or Bi or both also is referred to.

Alloy for connecting part of electric circuit. K. KUMODA and Tōyō DENCHI Kōgyō KAISHA (Oriental Battery Industrial Co.). Japan 36,520, June 4, 1920. The alloy is prepd. by adding 19% Ni and 20% Al to 61% Ag, fused in a crucible. It is used instead of Pt for connecting part of electric circuit.

Gears of aluminium alloy. R. D. BABSON. U. S. 1,371,214, Mar. 15. Cut gears are formed of an alloy containing about 94% Al, and 0.5% Mg, together with Cu. The alloy is thoroughly worked, heated to 500-525° and quenched before cutting into gears.

Casting metals. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,750, Jan. 7, 1921. Cores are made as described in 156,671, except that other binding agents are added to the pulverized pitch or the like, *e. g.*, loam, clay, kaolin, puzzuolana, portland or MgO cement, lime, gypsum, alkalis, blast-furnace dust, brown coal, peat, or lignite.

Casting metals. METALLHUTTE BAER & Co. Brit. 156,536, Jan. 5, 1921. Addition to 137,325. The process described in the principal patent is modified by replacing the varnish by an adhesive and either process is applied to metal, sand, or clay molds, etc. for casting Cu, Ni, or similar metals or their alloys.

Casting metals. C. McKNIGHT. Brit. 155,798, June 20, 1920. In casting Fe or steel articles, the mold is lined or the core is coated with a material that will combine with the gases and oxides in the molten metal. Al, Ti, and Mg in powdered form are stated to be suitable and may be applied dry by dusting or blowing on to mold surfaces. The powder may be mixed with a carrier and brushed or sprayed on. Examples of suitable carriers are molasses, H₂O, or a soln. preferably in H₂O of glue, starch, Na₂SiO₃, tannic acid, dextrose, gelatin, or other colloid. In addition, a material such as graphite, silica wash, or slaked CaO may be employed for lubrication and to prevent the casting from sticking in the mold. A satisfactory series of washes to apply is first, 2 gal. of Na₂SiO₃, 50 lbs. of powdered Al, 20 lbs. of graphite, made up with H₂O to 50 gal.; second, 1 pt. of molasses, 2 lbs. of powdered graphite, 1 lb. of powdered Al made up with H₂O to 2 gal.

Casting metals. C. FOHR and E. KLEINSCHMIDT. Brit. 156,671, Jan. 6, 1921. Sand for cores is combined with 2-3% of pitch, asphalt, or other bitumen, which has been atomized by scattering nozzles, or converted to fine powder form by wind-sifting.

Composition for case hardening of metals. PORTER W. SHIMER. Can. 210,372, Apr. 13, 1921. CaCN₂ is prepd. for use with a bath of fused salts in case hardening by mixing with pitch or tar and coking the mixt.

Disintegrating metal. EVERETT J. HALL. Can. 208,982, Mar. 1, 1921. A stream of molten metal is struck on all sides at convergent angles by a rotating annular flow of disintegrating gas. The angles are varied in accordance with the suction desired. The molten metal is lifted from the supply and discharged through a nozzle.

Metal-disintegrating apparatus. EVERETT J. HALL. Can. 208,983, Mar. 1, 1921. The app. comprises a tank for the metal, a nozzle, vertically disposed and in communication with the tank and means for entirely surrounding a stream of metal as it issues from the nozzle with an annular jet of disintegrating fluid directed on converging lines upon the stream.

Nozzles. EVERETT J. HALL. Can. 208,984, Mar. 1, 1921. A nozzle for disintegrating metal comprises a metal casing, a refractory lining extending outward beyond the end of the casing and a blast ring which surrounds the casing and lining and beyond which both of them extend outwardly.

Coating metals with metals. G. DE DUDZEELE ET CIE. Brit. 155,827, Dec. 17, 1917.—Articles of Fe, steel, or other common metals are amalgamated before being coated by a cold process, such as electroplating, with a protective or ornamental metal such as Ni, Cu, Ag, Au, or Pt. The Hg may be applied in metallic form, or as a soln. of a mercurous or mercuric salt, for instance HgCl₂. A cleaning agent, such as HCl and NH₄Cl may also be present in the soln. During electroplating an intermediate layer of an amalgam of both base and coating metals is stated to be formed.

Coating aluminium with other metals. O. HOMMEL. U. S. 1,370,967, Mar. 8. A thin layer of a metal salt such as AuCl₃, FeCl₃, U nitrate or Cu acetate is applied to the surface of Al which is to be coated and the coated surface is then heated sufficiently to effect reduction of the salt and adherence of the reduced metal to the Al.

Briquetting metallic fragments. O. C. DURYEA and M. C. WHITE. U. S. 1,371,671, Mar. 15. Briquets are formed of small particles of Fe or other metallic fragments by first subjecting the particles to a relatively low degree of compression and then suddenly welding them together by an explosive pressure which may be generated in a press cylinder to which a compression plunger is attached.

Solders. P. A. AGOSTINI. Brit. 156,665, Jan. 6, 1921. A solder for Al and other metals consists of about 50-53% of Zn, 30-35% of Sn, 1/4% of Cu, and 12-15% of Al.

10—ORGANIC CHEMISTRY

CHAS. A. ROULLIER

An improvement in the nomenclature of organic chemistry. T. SMERLOCK WHEELER. Glasgow. *Chem. News* 122, 122-4 (1921).—W. suggests that an international nomenclature congress (like that at Geneva of 1892) be called, and that it appoint a permanent committee authorized to make official names on the principles which the congress might adopt and to publish a polyglot dictionary of the old and new names; also, that the journals enforce the new system after a certain term of years. "A rough outline of what lines a really systematic system of nomenclature might take" is submitted, according to which C, H, N, O, S and other elements are indicated in the names by their initials while a, e and i denote degrees of satn. Examples: CH_4 is "monhac" (single-membered satd. compd. of H and C), C_2H_6 "dihac," C_3H_8 "dihec," C_4H_{10} "dihic," Me "monac" (CH_4 minus H), Et "diac," EtOH "hodihac," MeOEt "monac-o-dihac," EtSH "asdiac," Et_2S "diac-as-dihac," Me_2CO "2-oxy-trihac," AcH "oxydihac," AcOH "1-1-ho-oxy-dihac," MeNH_2 "monac-han," MePH_2 "monac-hap," MeNHNH_2 "monac-dihan" or "dian-monhac," MeNHOH "monac-hohan," MeCN "nic-monhac," MeNO_2 "monac-dioxygen," MeCl "chlormonhac," EtSO_3H "diac-ho-di-oxyes," cyclo-hexane "r-hexhac" or "rachex" (ring-satd. carbon-six-membered), C_6H_6 "ranhex," γ -pyrone "4-oxy-2.5-di(e)-raohex," C_6H_6 "crachex" (centric-ring-satd.-C-six-membered), Ph "cracex," C_{10}H_8 "bi-crac-dec," pararasaniline "tri (4.an.cracex). ho. monhac."

A. M. PATTERSON

Methylation of cellulose. III. Homogeneity of product and limits of methylation.

WILLIAM S. DENHAM. *J. Chem. Soc.* 119, 77-81 (1921); cf. *C. A.* 11, 1953.—D. prepd. a highly methylated cellulose (A) closely approaching the theory for trimethyl-cellulose. A is totally insol. in Schweitzer's reagent, retains the fibrous structure of the original cellulose, and contains 44.6% MeO. It is very nearly insol. in alc. and Me_2CO . Less highly methylated celluloses are not as homogeneous as A, and are partially sol. in S.'s reagent. Ordinarily the portions insol. in S.'s reagent had a higher MeO content than the original methylated cellulose. The most homogeneous of the less highly methylated cellulose, described was formed by treating cotton wool previously soaked in 20% NaOH soln., drained and pressed, with Me_2SO_4 in Et_2O . LOUIS E. WISE

The action of the Grignard reagent on certain nitric esters. HARRY HEPWORTH. Ardeer Factory, Stevenston, N. B. *J. Chem. Soc.* 119, 251-60 (1921).—Moureu (*Compt. rend.* 132, 837) investigated the action of MeMgI on MeNO_2 , but no other investigations have been reported. It has been found that the principal product of the reaction is the dimethyl- or diethylhydroxylamine. The best results were obtained when 3-4 mols. of the Grignard reagent were employed to each O. NO_2 group. EtNO_2 , $(\text{CH}_3\text{ONO})_2$, nitroglycerin and pentaerythritol tetraniatrate were studied. β , β -Dimethylhydroxylamine hydrochloride, small, elongated, laminated plates, m. 102° . Oxalate, small, hexagonal prisms from dry MeOH, m. 154° .

C. J. WEST

The melting points of mixtures of o- and p-toluenesulfonyl chlorides. LEONARD HARDING. Cambridge (England). *J. Chem. Soc.* 119, 260-2 (1921).— $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$, b_p 126° , d_4^{20} 1.3383, m. 10.7° , n_D 1.5528, n_D 1.5575, n_D 1.5713, n_D 1.5937, n_D^{20} 1.55653. The eutectic temp. was found to be 1.6° (Holleman, *C. A.* 5, 3820, gives 1°) and the eutectic mixt. contained 17.5% of the p-deriv. The following values are for the % of the p-deriv. and the m. p. of the mixt.: 0, 10.17° ; 2, 9.9° ; 5, 8.8° ; 8, 7° ; 10, 5.8° ; 12, 4.9° ; 14, 3.8° ; 15, 3° ; 16, 2.6° ; 17, 2.1° ; 17.25, 1.9° ; 17.5 (eutectic), 1.6° ; 17.75, 3.3° ; 18, 3.9° ; 19, 6.6° ; 20, 7.9° ; 25, 14.7° ; 29.1, 20.2° ; 35.3, 26.9° ; 42.2, 33.6° ; 50.2, 39.8° ; 56.2, 44.1° ; 62.8, 48.4° ; 68.8, 51.9° ; 78.2, 67.3° ; 89.7, 62.6° ; 100, 67.2° .

C. J. WEST

The action of ammonia on acetone. THOMAS STEWART PATTERSON AND ANDREW McMILLAN. Univ. Glasgow. *J. Chem. Soc.* 119, 269-71(1921).—In this preliminary paper P. and M. record the isolation of a compound $\text{MeCOCH}_2\text{CMe}_2\text{NHCMe}_2\text{NH}_2$ (?), from the interaction of NH_3 and acetone, thin prisms, m. 45° , volatilizes very rapidly. The titration indicated two basic centers, 1 of which reacts more rapidly with HCl than the other. The hydrochloride, $\text{C}_8\text{H}_{18}\text{ON}_2 \cdot \text{HCl}$, is cryst., and when heated with alc. goes into soln. but almost immediately a white ppt. seps. When acetone is satd. with NH_3 probably $\text{HOCMe}_2\text{NHCMe}_2\text{NH}_2$ is 1st formed, which then condenses with more acetone to form $\text{MeCOCH}_2\text{CMe}_2\text{NHCMe}_2\text{NH}_2$. On treatment with $(\text{CO}_2\text{H})_2$, this decomps., at once or on heating, to give diacetoneamine hydrogen oxalate, and $(\text{CO}_2\text{NH})_2$.

C. J. WEST

1,1-Dimethylcyclohexane from methylheptenone. ARTHUR WILLIAM CROSSLEY AND NORA RENOUF. Univ. London. *J. Chem. Soc.* 119, 271-5(1921).—C. and R. confirm the statement by Zelinsky and Lepeschkin (*C. A.* 7, 3128) that 1,1-dimethylcyclohexane may be prepd. from methylheptenone, though they do not recommend this as a method of prepn. There does not appear to be any evidence of the production of a deriv. of $p\text{-C}_6\text{H}_4\text{Me}_2$ from this cyclohexane, or of the wandering of a Me group in such reactions, other than ortho to its original position.

C. J. WEST

Gallotannin. XII. MAXIMILIAN NIERENSTEIN, CHARLES WILLIAM SPIERS AND ARTHUR GEAKE. Univ. Bristol. *J. Chem. Soc.* 119, 275-86(1921); cf. *C. A.* 8, 1778.—Sisley (*C. A.* 4, 191) and Trunkel (*C. A.* 4, 2545) consider the formation of ellagic acid (Z) as exptl. evidence for the presence of the *m*-digallic nucleus in gallotannin. N. is inclined to this view because: if the oxidation of gallotannin (X) is interrupted before the max. amt. of Z has been produced, a tannin-like residue is left (gallotannin residue A). The Z produced on hydrolysis of gallotannin residue A does not exist in the original X but is formed during oxidation. There is a distinct difference in the manner in which Z is produced from X and Me gallate. In the production of Z from X, there are 2 distinct stages: The 1st produces a max. of about 60 % of Z; the 2nd gives rise only to traces of Z but yields about 8 % of dextrose. These 2 stages do not synchronize, since the dextrose is mainly formed after all the Z has been produced. It therefore seems that the dextrose is derived from a source which is capable of producing little or no Z. This source (gallotannin residue B), about 30 % of the X used, yields, on hydrolysis approx. 2 % Z, 9 % dextrose and 84 % gallic acid. The max. yield of Z was obtained by oxidation in 0.5 N NaHCO_3 ; after 45 hrs. 59.2 % Z and 2 % dextrose, at 20° ; at 40° , the % of dextrose was increased to 7.6. Crude Z from Me gallate contained isogalloflavin, while that from X gave no trace of this substance. Gallotannin residue A was obtained by extg. the filtrate after oxidizing X in 0.5 N NaHCO_3 for 6 hrs. 50 g. X gave 16.8 g. colorless, amorphous product; this ppts. gelatin and alkaloids and gives all the color reactions of X; $[\alpha]_D^{20}$ in H_2O , 10 % soln., 65.4° ; in alc., 8 % soln., 42.6° ; in acetone, 8 % soln., 27.8° . On hydrolysis with dil. H_2SO_4 it yielded 8.6 % Z, 84.2 % gallic acid and 8.6 % dextrose. Gallotannin residue B was obtained after 40 hrs. oxidation, as above. About 10 g. were obtained, which gave the color reactions of X; the rotations were: H_2O , 10 % soln., 36.8° ; alc., 10 % soln., 11.4° ; acetone, 8 % soln., 18.4° ; on hydrolysis, this yielded 2.2 % Z, 85.4 % gallic acid and 8.4 % dextrose. Gallotannin residue C, prepd. by hydrolysis for 4 hrs. according to *C. A.* 8, 1778, gave, when oxidized at 20° in NaHCO_3 for 24 hrs., 45.7 % Z and 2.2 % dextrose, and, after oxidation for 76 hrs., 44.9 % Z, and 2.7 % dextrose. At 40° , after 32 hrs. oxidation there resulted 44.6 % Z and 6.2 % dextrose. 40 g. of gallotannin residue C in 0.5 N NaHCO_3 was oxidized for 40 hrs., and gallotannin residue D obtained, 19.8 g. of an amorphous product, resembling X, with a rotation in H_2O of 49.6° ; in alc., 6 % soln., 29.4° ; in acetone (8 %), 12.4° . On hydrolysis this gave 0.3 g. Z, 92.4 % gallic acid and 8.8 % dextrose. Since these observations were not in accord with the theory of the constitution of X, the methylation of

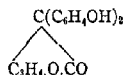
gallotannin residue *C* was studied; the methylated product resembled methylgallotannin with a rotation in C_6H_5N (10%) of 9.8° , and in C_6H_6 (8%) of 17.8° . On heating 10 g. of this product with 50 cc. glacial AcOH for 8 hrs. at 160° tetramethyl- α -glucose was isolated, in about the same yield as from methylgallotannin. This forces 1 of 2 conclusions: contrary to the pentadigalloylglucose formula for *X*, 4 HO groups of the glucose are free; the CH_2N_2 has replaced the acyl groups. To check such a remote possibility pentagalloylglucose was methylated; this yielded glucose and not tetramethylglucose on hydrolysis. These observations reopen the question as to whether pentadigalloylglucose actually represents the constitution of *X*, and N. has undertaken a revision of all his earlier work.

C. J. WEST

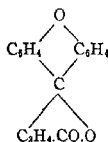
The condensation of *m*-dimethylaminophenol with benzaldehyde. SRI KRISHNA AND FRANK GEO. POPE. East London College. *J. Chem. Soc.* 119 286-9(1921).—*4*-Dimethylamino-2-hydroxybenzohydrol, $Me_2NC_6H_4(OH)CHPhOH$, was obtained by dissolving 13.7 g. *m*- $Me_2NC_6H_4OH$ in 400 cc. 10 % NaOH and adding 10.6 g. BzH. After 70 hrs. the hydrol was pptd. with CO_2 , which, pptd. from Et_2O by petr. ether, formed a nearly colorless solid, rapidly assuming a pink color on standing; it m. 146° . *Potassium salt*, dark red scale. *Hydrochloride*, red powder, decomp. 138° . *Acid oxalate*, dark colored powder, decomp. 93° . *Dibromide*, orange-red ppt., decomp. above 250° . *Acetate*, very pale brown, microcryst. powder, m. 70° . *Benzoate*, pale brown powder, m. 73° . *6*-Dimethylamino-3-hydroxy-9-phenylxanthenes, $C_{24}H_{19}O_2N$, by heating 2.86 g. of the hydrol with 2.2 g. resorcinol and 6 g. $ZnCl_2$ 4 hrs. at 170° , brown powder. *Benzoate*, $C_{28}H_{23}O_2N$, pale brown solid, m. $71-2^\circ$. *6*-Dimethylamino-3-hydroxy-9-phenyl-2-methylxanthenes, by condensation of the hydrol with *p*- MeC_6H_4OH , brown powder, m. 98° . *8*-Dimethylamino-11-phenyl- β -naphthaxanthenes, by condensation of the hydrol with β - $C_{10}H_7OH$, brown powder, m. 105° .

C. J. WEST

Phenolcitraconein. SRI KRISHNA AND FRANK GEO. POPE. East London College. *J. Chem. Soc.* 119, 289-91(1921).—20 g. PhOH, 10 g. citraconic anhydride and 10 g. $ZnCl_2$ were heated to 120° and dry HCl was passed through for 0.5 hr., and the mixt. heated for an additional 6 hrs. The melt was then heated with dil. HCl, and extd. with 3 % NaOH. HCl pptd. *phenolcitraconein* (I), light brown powder, m. $159-61^\circ$. The soln. in aq. alkali is red, which color is discharged by acids or by an excess of alkali. The *potassium salt* forms a "scale." *Tetrabromo derivative*, orange-yellow. *Diacetate*, light brown, microcryst. powder, m. 134° . *Dibenzoate*, m. 99° . *Dimethyl ether*, by the action of Me_2SO_4 and KOH, brown powder, m. 135° . *Diethyl ether*, m. 132° . *Fluoran derivative* (II), from 4.3 g. *p*- MeC_6H_4OH , 2.2 g. citraconic anhydride and 3 g. $ZnCl_2$, light gray solid, m. $128-9^\circ$.



I



II

C. J. WEST

Additive compounds of antipyrrolaminodiacetic acid and its salts with neutral salts. ROBERT GEORGE FARGHER AND HAROLD KING. Wellcome Chem. Res. Labs. *J. Chem. Soc.* 119, 292-8(1921).—*Calcium antipyrrolaminodiacetate*, from the $CaCl_2$ compd. of the free acid and $CaCO_3$, minute prisms, which form at least 2 hydrates, containing 12 and 6 mols. of H_2O , the lower hydrate being obtained by rapid crystn. from warm soln.: $C_{14}H_{16}O_4N_2Ca.12H_2O$ and $C_{14}H_{16}O_4N_2Ca.6H_2O$. *Barium salt*, with 1.5 H_2O , well formed, rectangular plates. *Strontium salt*, needles containing 9 or 6 mols. H_2O . *Sodium*

and *potassium salts*, cryst. readily sol. in H_2O . *Copper salt*, pale blue powder, somewhat sparingly sol. in cold H_2O . *Calcium chloride addition product* 4.73 g. $ClCH_2CO_2H$ in 12.5 cc. H_2O were treated with 8 g. $CaCO_3$ and 5.1 g. 4-aminoantipyrine and the mixt. was boiled 2 hrs., 1.2 g. $ClCH_2CO_2H$ and 2.6 g. $CaCO_3$ were added and the mixt. again was heated for 2 hrs. Upon acidification of the filtered soln., the addition product sepd. as rhombic prisms, with 8 H_2O , m. 165° (cor.). The *pentahydrate* has also been obtained; it loses 3 H_2O at 60° in *vacuo*. *Tetrahydrate*, large, hard crystals. *Calcium bromide*, prisms with 11 H_2O or tufts of soft silky needles with 6.5 H_2O . *Strontium chloride*, obtained from an acid soln., small needles with 2.5 mols. H_2O . *Sodium chloride*, felted mass of minute, prismatic needles with 3 mols. H_2O . *Potassium chloride*, clusters of small needle-shaped prisms containing 3 H_2O . *Lithium chloride*, minute rhombic prisms, with 3 H_2O . *Calcium chloride compound of the calcium salt*, from the mother liquor of the Ca salt, minute, hair-like needles, with 12 H_2O . *Barium-barium chloride complex*, minute silky needles, with 12 H_2O . It dissociates on heating in aq. soln., while the Ca- $CaCl_2$ complex is stable. *Magnesium-magnesium chloride complex*, diamond-shaped plates, with 11 H_2O . *Strontium-strontium chloride salt*, well defined flattened prisms, with 11 H_2O . A considerable excess of $SrCl_2$ must be used. *Ethyl antipyrilaminodiacetate*, $C_{15}H_{23}O_5N_3$, an oil, which could not be crystd., and which decompd. completely at 10 mm. The free acid could not be obtained cryst. C. J. West

Influence of negative groups of different character on the reactivity of hydrogen atoms carried by the same carbon atom. I. BIRAJ MOHAN GUPTA. Imp. Coll. Sci. and Tech. *J. Chem. Soc.* 119, 299-304(1921).—The expts. indicate that the reactivity of the $CH_2=$ group depends upon the total negative character of both radicals, and that if this does not reach a certain limit, the reactivity of the $CH_2=$ group vanishes, at least with respect to aldehydes. *a. Phenylacetamide*. AcH forms $MeCH(NHCOCH_2Ph)_2$ when concd. HCl is used. No reaction took place with such catalysts as Et_3NH , NH_3 , $NaOH$, $EtONa$, or 50% KOH . *Benzylidenebisphenylacetamide*, $PhCH(NHCOCH_2Ph)_2$, from 13.4 g. $PhCH_2CONH_2$ and 5.3 g. BzH by heating at 160° for 2 hrs., fine needles, m. 225° . KOH gave BzH NH_3 and $PhCH_2CO_2H$. *Anisylidenebisphenylacetamide*, $C_6H_4-O_2N_2$, light, fine needles, m. 241° . *Cinnamylidenebisphenylacetamide*, $C_6H_5CH=CH-CH_2CONH_2$, m. 238° . *Phenylethylidenebisphenylacetamide*, $C_6H_5CH_2CH_2CONH_2$, m. 223° . *b. p-Nitrophenylacetamide*. *Ethylidenebis-p-nitrophenylacetamide*, from 3.6 g. $p-NO_2-C_6H_4CH_2CONH_2$ and 3 g. AcH with 2 drops concd. HCl , m. 250° . The reactivity of the NH_2 group with AcH under the influence of HCl is completely inhibited in aq. soln. *c. Ethyl malonamate*. *Ethyl α -carbamylcrotonate*, from the interaction of 13.1 g. of this amide, 4.4 g. AcH and 2 drops of Et_3NH , m. 78° . If half the amt. of AcH is used, *ethyl α,α' -dicarbamyl- β -methylglutarate*, granular crystals, m. 177.5° , is obtained. In this case KOH was used as the catalyst. C. J. West.

The conditions underlying the formation of unsaturated and of cyclic compounds from halogenated open-chain derivatives. I. Products derived from α -halogenated glutaric acids. CHRISTOPHER KELK INGOLD. Imp. Coll. Sci. and Tech. *J. Chem. Soc.* 119, 305-329(1921).—I. has undertaken an investigation of the reason for the failure of Baeyer's strain theory to account satisfactorily for the relative ease of formation and the stability of the different types of C ring. The investigations of Stohmann and Kleber (*J. prakt. Chem.* [2] 45, 475(1892)) showed that the quantities of heat absorbed in the formation of similarly constituted compds. of various cyclo-rings did not agree at all with the angle of strain as obtained from Baeyer's theory. The agreement is much better if Traube's values are used in calcg. the angle between each pair of C-C valencies in a polymethylene chain, and the new values are also in complete qual. accord with more purely chem. experience. It also accounts for the striking effect of the *gem*-grouping in promoting ring formation. In view of these and other facts satisfactorily collated by the modified strain theory, it seemed desirable to undertake a series of expts. with the

definite object of justifying the introduction of at. vol. into this branch of stereochemistry. The reaction best suited for this study seemed to be the elimination of HBr by means of alkali from the α -Br substitution products. The first study is confined to the derivs. of glutaric acid. In the action of 6 *N* alc. KOH on Et α -bromoglutarate it was possible to account for 66% of the material as follows: α -hydroxyglutaric acid, 16, glutaconic acid, 3, *trans*-cyclopropane-1,2-dicarboxylic acid, 35, the *cis* acid, 4, paraconic acid, 8. These figures indicate in an exceedingly clear manner the remarkable tendency towards the formation of cyclopropane derivs. by the elimination, along with the Br, of an atom of H from the α -C atom of the acid. Glutaric acid is best prepd. by the oxidation of cyclopentanone by HNO₃, 1 kg. giving 300–350 g. of the acid. Et α -bromoglutarate was prepd. by heating a mixt. of 200 g. glutaric acid and 280 cc. SOCl₂ and then adding 87 cc. Br in 6 portions, while the chloride was heated to 60° before a naked arc light. It b₁₁ 142°, and was obtained in 50 % yield. The di-Br compd. was prepd. in the same way, with 174 cc. Br. If the reaction product is poured into HCO₂H and extd. with CHCl₃, the residue is *meso*- α,α -dibromoglutaric acid, dense, very hard prisms, m. 170°, from Et₂O-CHCl₃. The residue from the CHCl₃ ext. is the *d, l*-compound, heavy oblique prisms, presenting a curious speckled appearance (owing to certain of the crystal facets transmitting practically the whole of the incident light), m. 142°. *Methyl ester*, b₂₂ 172°. *Ethyl ester*, b₂₁ 174–5°. *Isopropyl ester*, b₂₁ 195°. The action of 2 *N* Na₂CO₃ on A gave α -hydroxyglutaric acid, C₅H₈O₆, large prisms from moist AcOEt, m. 98–100°, with the formation of the lactonic acid (Wolff, *Ann.* 260, 129); the lactonic acid, m. 50°; and *trans*-cyclopropane-1,2-dicarboxylic acid, m. 174°. The action of 6 *N* alc. KOH gave the products listed above. The Et₂O-insol. fraction contained α -hydroxyglutaric acid, its lactonic acid and paraconic acid. The action of 2 *N* Na₂CO₃ on the *meso*-di-Br deriv. gave *meso*- α,α -dihydroxyglutaric acid, C₅H₈O₆, which crystallizes from acetone in thick prismatic crystals, m. 162°. The *trans*-lactonic acid, C₅H₆O₆, was prepd. by heating the above acid, and was also obtained from the acetone mother liquors on adding C₆H₆, m. 148.5–50°. *Meso*-diamide, C₇H₁₀O₄N, thin, glistening plates, m. 223°. *Meso*-di-*p*-toluicide, m. 232°. The *d, l*-di-Br acid, treated in a similar way, gave *d, l*- α,α -dihydroxyglutaric acid, which changed into the *cis*-lactonic acid in the steam-bath; it m. 125°. The solid residues from the acetone ext. consisted of the *cis*-lactonic acid, m. 166–8°. *d, l*-Diamide, stout oblique prisms, m. 156°; unlike the *meso*-deriv., it is very sol. in hot alc. *d, l*-Di-*p*-toluicide, slender needles from alc., m. 179°. On hydrolysis of the esters of the di-Br acid, an Et₂O-sol. product and a H₂O-sol. product were obtained. The latter was a mixt. of the *meso*- and *d, l*-di-HO acids described above. The Et₂O-sol. part gave *l*-bromocyclopropane-1,2-dicarboxylic acid, dense, thick prisms, m. 172°. The acid is stable to HNO₃, concd. HCl, and alk. KMnO₄. *Aniline salt*, rosetts of needles, m. 130°. A diamide could not be obtained. The hydrolysis of the iso-Pr ester gave, as the Et₂O-sol. part, cyclopropanol-1,2-dicarboxylic acid, (B) short needles, m. 206–210°. The Br deriv. also was obtained. The action of 6 *N* MeOH-KOH on the di-Br Et ester gave the *meso*- and *d, l*-di-HO acids and their lactonic acids; also: methoxycyclopropane-1,2-dicarboxylic acid, C₆H₈O₆, from the Et₂O-sol. sirup, dense, prismatic crystals, m. 119–121°. The residue, upon esterification, gave Et α -ketoglutarate, b₇, 152–5°. The action of concd. H₂SO₄ on B gave cyclopropanone, isolated as the semicarbazone, short needles, m. 230–3°, EtCO₂H, and succinic acid.

C. J. WAST

Mechanism underlying the reaction between ethyl cyanoacetate and tautomeric substances of the keto-enol type. CHRISTOPHER KELK INGOLD. *Imp. Coll. of Sci. and Tech. J. Chem. Soc.* 119, 329–341 (1921).—Although it is almost certain that ketones condense with CNCH₂CO₂Et only by virtue of their capacity to pass into their enolic modifications, the reason why this should be the case is still obscure and no evidence appears to have been offered on this interesting question thus raised. The problem is to

* discover wherein lies the cause of the reactivity of the enolic forms. There are two possibilities: One is that the prime reaction consists in the elimination of H_2O through the union of the HO groups of the enolized substance with the reactive H atom of the CN ester. The other is that the reactive feature is the double bond. The evidence obtained in the present investigation is strongly in favor of the suggestion that the unsatd. linking is responsible for the initial condensation, and the elimination of H_2O is a subsequent effect. Since it is well known that unsatd. esters react with $CNCH_2CO_2Et$, the behavior of the HO esters (9 in number) was studied. The general method of procedure was to treat a suspension of $CHNa(CN)CO_2Et$ from 11.5 g. Na and 58.5 g. $CNCH_2CO_2Et$ in 160 g. EtOH with 0.5 g.-mol. of the HO esters in 50 g. alc. and heat for 36 hrs. on the H_2O bath. The product was poured into H_2O , acidified, and extd. with Et_2O . The ext. was washed with Na_2CO_3 , the alk. soln. acidified and again extd. Each fraction was hydrolyzed with concd. H_2SO_4 , and the products were identified. $CH_2(OH)CO_2Et$ gave no condensation product. Et lactate gave a very poor yield of Et α -cyanoglutarate. Et α -hydroxyisobutyrate gave: *ethyl γ -cyano- α -methylglutarate*, $b_{74} 160-2^\circ$; *ethyl γ -cyano- α -methylbutyrate*, $C_8H_{12}O_5N$, $b_{75} 210-2^\circ$. Et hydracrylate gave good yields of Et γ -cyanoglutarate and Et γ -cyanobutyrate. Et β -hydroxybutyrate gave: *ethyl α -cyano- β -methylglutarate*, $C_{11}H_{17}O_5N$, $b_{84} 180-5^\circ$, and *ethyl γ -cyano- β -methylbutyrate*, $C_8H_{12}O_5N$, $b. 105-9^\circ$. Et α -hydroxyglutarate gave only a small yield of condensation product. *ethyl α -cyanomethanetriacetate*, $C_{10}H_{12}O_6N$, could not be completely purified because of lack of material. Et malate gave Et α -cyanotricarballylate and *ethyl α -cyanopropene- β,γ -dicarboxylate*, $b_{87} 166-9^\circ$.

C. J. WEST

Experiments on the synthesis of the polyacetic acids of methane. I. The conditions controlling synthesis by the cyanoacetic ester method and the preparation of methanetriacetic acid. CHRISTOPHER KELK INGOLD. *Imp. Coll. Sci. and Tech. J. Chem. Soc.* 119, 341-354 (1921); cf. preceding abstrs.—This study was undertaken with the idea of prepg. such acids as $CH(CH_2CO_2H)_3$, $CO_2HC(CH_2CO_2H)_2$ and $C(CH_2CO_2H)_4$. In the preceding abstr. it was shown that the great majority of the cyanoacetic ester condensations were to be referred to the direct addition of $CNCH_2CO_2Et$ to an unsatd. compd. In view of this, the difficulty of prepg. the higher polyacetic acids of CH_2 by such a synthesis will readily be apparent, for it will be observed that the unsatd. acids: $CO_2HCH:CHCH_2CO_2H$, $CO_2HCH:C(CO_2H)CH_2CO_2H$ and $CO_2HCH:C(CH_2CO_2H)_2$, having in their compn. 1 mol. of AcOH less than the polyacetic acids desired, are all substances of the "mobile" glutaric acid type, that is to say, in their permanent forms they are *not* unsatd. acids. The "normal" forms exist in tautomeric equil. with their unstable unsatd. isomerides. The possibility of obtaining condensation products clearly depends upon the relative permanence of the phases and the rapidity of the tautomeric interchange. These peculiar conditions which regulate the condensations of $CNCH_2CO_2Et$ with unsatd. substances are still, apparently, the controlling factors when halogen compds. are used. The triacetic acid, however, was obtained by the condensation with Et β -hydroxyglutarate and subsequent hydrolysis. Et citrate, on the other hand, gave no trace of polyacetic acid. These results are in agreement with the view that all such condensations proceed by way of an unsatd. intermediate product. The high yield in the case of Et β -hydroxyglutarate indicates some condition requiring examn. *Condensation of Et aconitate with $CNCH_2CO_2Et$.*—258 g. Et aconitate were added to a suspension in 300 cc. alc. of $CHNa(CN)CO_2Et$ from 23 g. Na and 113 g. $CNCH_2CO_2Et$ and the mixt. was heated 7 hrs. on the H_2O bath. The reaction mixt. was poured into 2.5 l. H_2O , and extd. with Et_2O (neutral ext., containing 40 g. Et aconitate). The aq. soln. was acidified with HCl, and extd. with Et_2O ; the Et_2O soln. was washed with Na_2CO_3 (Ext. A). The alk. soln. was acidified and again extd. (Ext. B). Ext. A. contained *ethyl α -cyanobutane- $\alpha,\beta,\gamma,\delta$ -tetracarboxylate* (I),

$\text{CH}_3(\text{CO}_2\text{Et})\text{CH}(\text{CO}_2\text{Et})\text{CH}(\text{CO}_2\text{Et})\text{CH}(\text{CN})\text{CO}_2\text{Et}$, viscous oil, b_D 230°. Upon hydrolysis with concd. H_2SO_4 , this gave *bulane- $\alpha,\beta,\gamma,\delta$ -tetracarboxylic acid*, which crystallizes with H_2O , m. 189°; dried at 200°, it m. 232°. *Ethyl ester*, b_D 201°. This ester was obtained from the neutral ext., together with *ethyl cyclopentanone-3,4-dicarboxylate*, $\text{C}_{14}\text{H}_{18}\text{O}_4$ (II), b_D 160–2°. The free acid (Auwers, *Ber.* 21, 242; 24, 313, etc.) m. 189°. *Semicarbazone*, $\text{C}_8\text{H}_{11}\text{O}_5\text{N}_3$, long needles, m. 225° (decompn.). *Dianilide*, needles, m. 195° (decompn.). Expts. were also made in which Et aconitate prepd. from Et acetyl-citrate, "labile" aconitic acid, and the "labile" Ag salt were used, but the results were the same in each instance. *Condensation of Et β -chlorotricarballylate with $\text{CHNa}(\text{CN})\text{CO}_2\text{Et}$* . Bertram (*Ber.* 36, 3297) was unable to isolate any of the products of this condensation. 290 g. of the Cl ester and the Na salt from 113 g. $\text{CNCH}_2\text{CO}_2\text{Et}$ and 23 g. Na gave Et aconitate, 13 g. I and some II. The condensation of Et α -hydroxyglutarate with CHNaCO_2Et gave a 65 % yield of *ethyl α -cyanomethanetriacetate*, b_D 203–4°. Upon hydrolysis with dil. H_2SO_4 , 93 % of $\text{CH}(\text{CH}_2\text{CO}_2\text{H})_3$ was obtained. The *anhydro acid* $\text{C}_7\text{H}_8\text{O}_5$ prepd. by digesting the acid, m. 115°, with AcCl , viscous colorless gum. *Dianilic acid*, $\text{C}_{13}\text{H}_{13}\text{O}_5\text{N}_3$, by the action of PhNH_2 upon the reaction product of SOCl_2 and the acid, prismatic needles, m. 192°. The condensation of Et citrate and $\text{CHNaCNCO}_2\text{Et}$ gave a small amt. of I and some II. C. J. WEST

The halogen derivatives of nitroform. ALEXANDER KILLEN MACBETH AND DAVID DOUG PRATT. Univ. St. Andrews. *J. Chem. Soc.* 119, 354–358 (1921).—The absorption of C_2H_2 by fuming HNO_3 (d. 1.545) containing 0.5–1.0 % $\text{Hg}(\text{NO}_3)_2$ as a catalyst is most complete when the gas is passed at the rate of 300–400 cc. per hr., and the acid maintained at 30°. After 8 hrs., oxidation becomes marked. The addition of concd. HCl to the mixt. of $\text{CH}(\text{NO}_2)_3\text{--HNO}_3$, preferably after a certain diln. of the mixt. causes the sepn. of *chlorotrinotromethane*, about 21–25 g. being obtained from 100 g. HNO_3 . It is a clear, mobile oil, b_D 35°, b_{20} 51.5–52°, m. 4.2–4.4°, n_D 1.4560, d_4 1.6616. It has a penetrating, unpleasant odor, resembling chloropicrin and it affects the eye. The Cl compd. is also obtained by passing Cl into the $\text{CH}(\text{NO}_2)_3\text{--HNO}_3$ mixt. and also by the action of Cl on $(\text{NO}_2)_3\text{CK}$. *Bromotrinotromethane* may be prepd. by any of the methods employed for the Cl compd. It is a pale yellow, heavy liquid, b_D 59°, b_{14} 63°, b_{20} 68°, b_{28} 78°, m. 9.5–10°, n_D 1.4900, d_4 2.07. The compd. seemed to contain some di-Br deriv. It dists. in steam with little decompn. The *iodo derivative* could not be obtained pure, and the compd. described by Meisenheimer and Schwarz (*Ber.* 39, 2543) was impure and probably a decompn. product. Color reactions of $\text{C}(\text{NO}_2)_3$, $\text{C}(\text{NO}_2)_2\text{Cl}$, and $\text{C}(\text{NO}_2)_2\text{Br}$ with EtSH , Et_2S , Me_2Ph , carvene and piperidine are given. The colors developed do not follow any fixed order for the 3 compds. C. J. WEST

The influence of sodium chloride and sodium sulfate on the solubility in water of sodium β -naphthalenesulfonate. W. TERNENT COOKE. Univ. Adelaide. *J. Soc. Chem. Ind.* 40, 56T (1921).—The curves show that the soly. of the β -salt is reduced practically to 0 when the concn. of the inorg. salt reaches about 10 g. in 100 g. of soln., especially at the lower temp. The influence of the β -salt on the soly. of Na_2SO_4 is practically negligible. The results are shown by means of curves, no figures being given. C. J. WEST

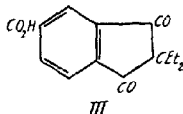
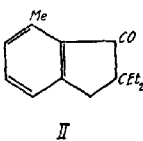
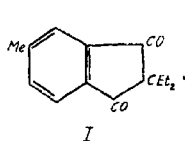
Hydrogenation in the naphthalene series. F. M. ROWE. *J. Soc. Chem. Ind.* 40, 58T (1921); cf. C. A. 14, 2927.—A correction, calling attention to the fact that 1,2- $\text{C}_{10}\text{H}_{10}$ can only be purified through the dibromide and removal of the Br atoms. C. J. WEST

Fats and fatty acids from hydrocarbons. ANON. *J. Soc. Chem. Ind.* 40, 62–4R (1921).—The 2 classes of methods are reviewed for producing fatty acids from hydrocarbons: synthesis from C_2H_2 or C_4H_6 , or by the Zelinsky process (Grignard reaction) and oxidation by O_3 and atm. O . There is need for a complete survey of the chemistry of the higher paraffins and olefins; definite information as to the occurrence of particular hydrocarbons in different fractions of mineral oils is lacking, methods of character-

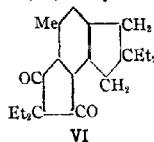
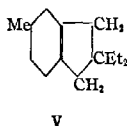
izing the various mineral oils must be available, etc. Then will be time enough to study the synthetic or oxidation reactions.

C. J. WESR

Synthesis of indandiones. VII. KARL FLEISCHER. Univ. Frankfurt *Ann.* 422, 231-65 (1921); cf. *C. A.* 12, 143.—The condensation of PhMe with $\text{Et}_2\text{C}(\text{COCl})_2$ yields 2 isomeric indandiones: *benz-5-methyl-2-diethylindan-1,3-dione* (I), and *benz-4-methyl-2-diethylindan-1,3-dione* (II), besides *diethyl-di-p-tolucylmethane*, $\text{Et}_2\text{C}(\text{COC}_6\text{H}_4\text{Me})_2$ (Z). 118.2 g. $\text{Et}_2\text{C}(\text{COC}_6\text{H}_4\text{Me})_2$ and 55.2 g. PhMe in 150 cc. CS_2 are treated with 120 g. AlCl_3 in small portions and boiled till evolution of HCl ceases. It is then decompd. with ice and distd. with steam, which requires 12-15 hrs. The distillate, extd. with Et_2O and crystd. from MeOH, gives 29 g. I, m. 49-50°. The mother liquor contains II, b₁₄ 140-55°, obtained in a yield of 25 g. The residue in the flask from the steam distn. is III, b₁₈ above 215°, glistening prismatic columns, m. 94-5°. Heated with 1:1 KOH and acidified, Z yields *p*- $\text{MeC}_6\text{H}_4\text{CO}_2\text{H}$. The constitution of I was established by oxidation with fuming HNO_3 in a sealed tube for 24 hrs. at 160°, when trimellithic acid (z), m. 229-30°, is obtained in a 51 % yield. Using milder conditions [2 g. I, 2 cc. fuming HNO_3 , 2 cc. H_2O] for 6 hrs. at 145°, *benz-2-diethylindandione-5-carboxylic acid* (III), m. 136-7°, may be isolated, which yields A on further oxidation. II, on oxidation under the milder conditions, gave 1,3- $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$. 1 g. I, warmed with 1.5 g. HNO_3 and 2.5 g. concd. H_2SO_4 0.5 hr. at 100°, gave a *nitro derivative*, $\text{C}_{14}\text{H}_{13}\text{O}_4\text{N}$, m. 82-3°. Nitration of II gave a small amt. of a substance, m. 185°. 15 g. I, reduced with 120 g. Zn-Hg and excess concd. HCl by heating 8 hrs., gave *benz-5-methyl-2-diethylhydrindene*(V), mobile oil, b₁₂ 123-7°, d₂₀ 0.9197, n_D 1.51055. The reduction of II gave a *hydrocarbon*, $\text{C}_{14}\text{H}_{12}$, b₁₂ 110-6°, d₂₀ 0.9007, n_D 1.50742, the constitution of which has not been established. V may be again condensed with $\text{Et}_2\text{C}(\text{COC}_6\text{H}_4\text{Me})_2$, giving *benz-5-methyl-2-diethyl-7-diethyl-v-dihydrindan-6,8-dione* (VI), brown oil, b₁₄ 212-21°. Cymoldiethylindandione (B) (*C. A.* 4, 2144) yields on oxidation 1,2,3,4- $\text{C}_6\text{H}_2(\text{CO}_2\text{H})_4$, m. 235°. Upon reduction B yields *benz-4-methyl-7-isopropyl-2-diethylhydrindene* (C), $\text{C}_{17}\text{H}_{20}$, b₁₅ 157-65°, d₂₀ 0.9148, n_D 1.5112. *Benzo-4-methyl-8-isopropyl-2-diethyl-6-diethyl-sym-dihydrindene-5,7-dione*, (D), $\text{C}_{24}\text{H}_{24}\text{O}_2$, obtained through condensation of C with $\text{Et}_2\text{C}(\text{COC}_6\text{H}_4\text{Me})_2$, b₂₀ 238-42°. Upon reduction with Hg-Zn and HCl , D gives *benz-4-methyl-8-isopropyl-2-diethyl-6-diethyl-sym-dihydrindene*, $\text{C}_{24}\text{H}_{28}$, b₁₅

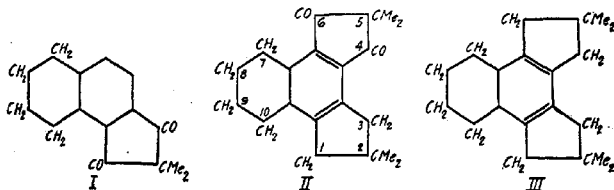


1:1 KOH and acidified, Z yields *p*- $\text{MeC}_6\text{H}_4\text{CO}_2\text{H}$. The constitution of I was established by oxidation with fuming HNO_3 in a sealed tube for 24 hrs. at 160°, when trimellithic acid (z), m. 229-30°, is obtained in a 51 % yield. Using milder conditions [2 g. I, 2 cc. fuming HNO_3 , 2 cc. H_2O] for 6 hrs. at 145°, *benz-2-diethylindandione-5-carboxylic acid* (III), m. 136-7°, may be isolated, which yields A on further oxidation. II, on oxidation under the milder conditions, gave 1,3- $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$. 1 g. I, warmed with 1.5 g. HNO_3 and 2.5 g. concd. H_2SO_4 0.5 hr. at 100°, gave a *nitro derivative*, $\text{C}_{14}\text{H}_{13}\text{O}_4\text{N}$, m. 82-3°. Nitration of II gave a small amt. of a substance, m. 185°. 15 g. I, reduced with 120 g. Zn-Hg and excess concd. HCl by heating 8 hrs., gave *benz-5-methyl-2-diethylhydrindene*(V), mobile oil, b₁₂ 123-7°, d₂₀ 0.9197, n_D 1.51055. The reduction of II gave a *hydrocarbon*, $\text{C}_{14}\text{H}_{12}$, b₁₂ 110-6°, d₂₀ 0.9007, n_D 1.50742, the constitution of which has not been established. V may be again condensed with $\text{Et}_2\text{C}(\text{COC}_6\text{H}_4\text{Me})_2$, giving *benz-5-methyl-2-diethyl-7-diethyl-v-dihydrindan-6,8-dione* (VI), brown oil, b₁₄ 212-21°. Cymoldiethylindandione (B) (*C. A.* 4, 2144) yields on oxidation 1,2,3,4- $\text{C}_6\text{H}_2(\text{CO}_2\text{H})_4$, m. 235°. Upon reduction B yields *benz-4-methyl-7-isopropyl-2-diethylhydrindene* (C), $\text{C}_{17}\text{H}_{20}$, b₁₅ 157-65°, d₂₀ 0.9148, n_D 1.5112. *Benzo-4-methyl-8-isopropyl-2-diethyl-6-diethyl-sym-dihydrindene-5,7-dione*, (D), $\text{C}_{24}\text{H}_{24}\text{O}_2$, obtained through condensation of C with $\text{Et}_2\text{C}(\text{COC}_6\text{H}_4\text{Me})_2$, b₂₀ 238-42°. Upon reduction with Hg-Zn and HCl , D gives *benz-4-methyl-8-isopropyl-2-diethyl-6-diethyl-sym-dihydrindene*, $\text{C}_{24}\text{H}_{28}$, b₁₅



215-20°, d₂₀ 0.9466, n_D 1.5247. From alc. it forms large flat plates, m. 69-71°. Upon oxidation, impure $\text{C}_6(\text{CO}_2\text{H})_4$ was obtained. C, condensed with AcCl in CS_2 with AlCl_3 gives *benz-4-methyl-5(6)?-acetyl-7-isopropyl-2-diethylhydrindene*, $\text{C}_{19}\text{H}_{20}\text{O}$, b₁₄ 190-5°. The condensation of 71 g. α - MeC_6H_4 with 98.5 g. $\text{Et}_2\text{C}(\text{COC}_6\text{H}_4\text{Me})_2$ in 280 cc.

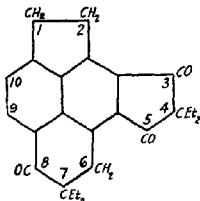
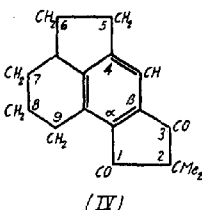
CS_2 with 120 g. AlCl_3 gave 56 g. α -methyl-naphthdiethylindandione, $\text{C}_{18}\text{H}_{18}\text{O}_2$, which, although it b_p 234–6°, is probably a mixt. Similarly, β -methyl-naphthdiethylindandione, $\text{C}_{18}\text{H}_{18}\text{O}_2$, b_p 230–40°, was prepd. The condensation of p - $\text{C}_6\text{H}_4(\text{OMe})_2$ with $\text{Et}_2\text{C}(\text{COCl})_2$ proceeds best if an excess of the chloride is used as a solvent. 0.1 mol. of the ether in 0.2 mol. $\text{Et}_2\text{C}(\text{COCl})_2$ is treated with 30 g. AlCl_3 and warmed 3 hrs. at 100°. After distn. with steam, the product was extd. with Et_2O , and the ext. shaken with NaOH . The Et_2O soln. contained benz-4,7-dimethoxy-2-dimethylindan-1,3-dione, m. 170–1°, and *l*-isobutyl-5(6)-hydroxy-2(3)-methoxybenzene, also found in the alk. soln., b_p 163°. The H_2SO_4 soln. is brown, while the dil. alk. soln. has a greenish blue fluorescence. Concd. NaOH gives a solid, yellowish sodium salt. 0.2 mol. veratrole and $\text{Et}_2\text{C}(\text{COCl})_2$ in 150 cc. CS_2 , treated with 60 g. AlCl_3 , gave veratrodimeethylindandione, $\text{C}_{18}\text{H}_{14}\text{O}_4$, long threads, m. 228°, and guaiacoldimeethylindandione (E), $\text{C}_{18}\text{H}_{14}\text{O}_4$, m. 192°. Pyrocatecholdimeethylindandione, $\text{C}_{17}\text{H}_{10}\text{O}_4$ (F), small leaflets, m. 297°, is also formed. Acetate of E, $\text{C}_{18}\text{H}_{14}\text{O}_6$, short needles, m. 176–7°. Diacetate of F, $\text{C}_{18}\text{H}_{10}\text{O}_6$, needles, m. 152°. The condensation of $\text{Et}_2\text{C}(\text{COCl})_2$ with anisole gave a product, $\text{C}_{15}\text{H}_{14}\text{O}_4$, b_p 150–80°, besides isobutylphenol, $\text{C}_{10}\text{H}_{12}\text{O}$, b_p 125–35°. VIII. Indandione derivatives of thianthrene. KARL FLEISCHER AND JOHANN STEMMER. *Ibid* 265–72.—Thianthrene (A) was prepd. by treating 120 g. SCl_2 and 200 g. C_6H_6 with 100 g. AlCl_3 in portions, but so added that the reaction proceeds violently. After warming 2 hrs. at 100°, the product is decompd. with ice and distd. with steam. Yield, 63 g., m. 153–4°. 21.6 g. A and 19.7 g. $\text{Et}_2\text{C}(\text{COCl})_2$ in 150 cc. CS_2 were treated with 30 g. AlCl_3 during 0.5 hr., warmed 1.5 hrs., and distd. with steam for 2 hrs. Thianthrenediethylindandione, $\text{C}_{18}\text{H}_{10}\text{O}_2\text{S}_2$ (B), crysts. from C_6H_6 in citron-yellow prisms, m. 135–6°. The soln. in concd. H_2SO_4 is a dirty bluish black, which changes to red upon addition of dil. HNO_3 . Oxidized with 30% H_2O_2 in hot AcOH , thianthrenedisulfonediethylindandione, $\text{C}_{18}\text{H}_{10}\text{O}_6\text{S}_2$, is formed, long pale yellow, needles from AcOH , m. 213–5°. Upon reduction of B with Zn-Hg and concd. HCl , thianthrenediethylhydrindene, $\text{C}_{18}\text{H}_{12}\text{S}_2$, is formed, yellow thick oil, b_p 277–8°. Upon oxidation with H_2O_2 this gives thianthrenedisulfonediethylhydrindene, $\text{C}_{18}\text{H}_{12}\text{O}_6\text{S}_2$, small needles from AcOH , m. 191–2°. HI and red P appear to reduce only 1 CO group in B, giving a compound $\text{C}_{18}\text{H}_{10}\text{O}_3\text{S}_2$, m. 104–6°. Dimethylthianthrene, (*Bull. soc. chim.* [3] 15, 424), was prepd. from 100 g. PhMe , 60 g. SCl_2 and 60 g. AlCl_3 , b_p 244°. The condensation product with $\text{Et}_2\text{C}(\text{COCl})_2$ was an oil, which decompd. on distn. IX. The action of substituted malonic acid chlorides on partially hydrogenated aromatic hydrocarbons. KARL FLEISCHER AND FRITZ SIEFERT. *Ibid* 272–317.—I Tetrahydronaphthalene. 44 g. $\text{C}_{10}\text{H}_{12}$ and 56.3 g. $\text{Me}_2\text{C}(\text{COCl})_2$ in 150 g. CS_2 were treated with 90 g. AlCl_3 , and, after standing overnight, heated 3 hrs. at 100° and then distd. with steam. 2-Dimethyltetrahydronaphth- α,β -indan-1,3-dione (I), m. 75°. Heated with 1:1 KOH , I gives tetrahydronaphthalene-1-isobutyl-2-carboxylic acid, $\text{C}_{16}\text{H}_{18}\text{O}_3$, microneedles from ligroin, m. 120°. It does



not condense with PhNHNH_2 . Reduced with Zn-Hg and HCl , I gives 2-dimethyl-tetrahydronaphth- α,β -hydrindene, $\text{C}_{18}\text{H}_{20}$, easily mobile oil, b_p 156°. This condenses with $\text{Et}_2\text{C}(\text{COCl})_2$ to form 2-dimethyl-5-dimethyltetrahydronaphthdiethylindan-4,6-dione

(II), yellowish crystals, m. 148–9°. Upon heating with KOH this yields 2-dimethyl-tetrahydronaphth- α,β -hydrinden-4(5)-isobutryl-5(4)-carboxylic acid, $C_{30}H_{38}O_4$, micro-needles, m. 181°. Upon reduction II gives 2-dimethyl-5-dimethyltetrahydronaphthdi-hydrindene, $C_{26}H_{34}$ (III), microprisms, m. 105–6°. This is a member of a new class of compds., which may be looked upon as a combination of a C_6H_4 ring with 2 reduced C_6 rings and a reduced C_8 ring. Oxidation of I with HNO_3 by heating 6 hrs. at 120° (sealed tube) gave benz-2-dimethylindan-1,3-dione-6,7-dicarboxylic acid (C. A. 7, 3737), though the m. p. is found to be 217° and not 229–33°. The oxidation of II gave benz-2-dimethylindan-1,3-dione-4,5,6,7-tetracarboxylic acid, $C_{30}H_{18}O_{10}$, m. 277° (decompn.). A small amount of mellitic acid also was found. $Et_3C(COCl)_2$ was also condensed with $C_{10}H_{12}$. 2-Diethyltetrahydronaphth- β,β -indan-1,3-dione, $C_{17}H_{20}O_2$ (A), large, water-clear prisms from EtOH, m. 118°. The α,β -isomer (B) seps. on concg. the alc. liquor, needles, m. 54–5°. Heated with 1:1 KOH, B gives tetrahydronaphthalene-1-diethylacetyl-2-carboxylic acid, $C_{17}H_{20}O_3$, long, pointed plates, m. 134–5°. The reduction of A gives 2-diethyltetrahydronaphth- β,β -hydrindene, $C_{17}H_{24}$, long needles, m. 49°. The α,β -isomer is an oil, b_D^{25} 1.63–5°. The oxidation of A gave pyromellitic acid. B, on oxidation, yields benz-2-diethylindan-1,3-dione-6,7-dicarboxylic acid, $C_{15}H_{14}O_6$, m. 174–6°. The condensation of dihydronaphthalene with $Et_3C(COCl)_2$ gave dihydronaphthdiethylindandione, $C_{14}H_{12}O_2$, needles, m. 99–101°. 2-Tetrahydroacenaphthene, $C_{12}H_{14}$, was prepd.

by pouring 60 g. $C_{12}H_{14}$ in 600 g. boiling AmOH on to 72 g. Na and boiling for about 3 hrs. in a yield of 99 g. Condensed with $Me_3C(COCl)_2$, it gives 2-dimethyl-tetrahydroacenaphth- α,β -indan-1,3-dione (IV), b_D^{25} 215–20°, m. 105–6°. Reduction gives 2-dimethyltetrahydroacenaphth- α,β -hydrindene, $C_{17}H_{22}$, b_D^{25} 1.73–5°, d_{20} 0.9884, n_D 1.5399. The oxidation of IV gives benz-2-dimethylindan-1,3-dione-5,6,7-tricarboxylic acid, $C_{14}H_{10}O_6$, micro-needles, m. 245°. 2-Diethyltetrahydroacenaphth- α,β -indan-1,3-dione, $C_{19}H_{22}O_2$, large prisms, m. 88–9°. On reduction this gives 2-diethyl-tetrahydroacenaphth- α,β -hydrindene, $C_{19}H_{24}$, b_D^{25} 1.90–198°, while on oxidation, benz-2-diethylindan-1,3-dione-5,6,7-tricarboxylic acid is formed, prisms, m. 188–90° (decompn.), together with $C_4H(CO_2H)_3$, m. 230°. Tetrahydrodiphenyl condenses with $Et_3C(COCl)_2$ to form benz-2-diethyl-5-tetrahydrophenylindan-1,3-dione, $C_{19}H_{22}O_2$, prismatic plates, m. 88°. On oxidation it yields trimellitic acid, decomp. 235° (this is the purest material examd.), together with benz-2-diethylindan-1,3-dione-5-carboxylic acid. Upon heating with 1:1 alkali, α -benzene-1(2)-diethylacetyl-5-tetrahydrophenyl-2(1)-carboxylic acid, m. 198°, and a β -acid, m. 98–100°, $C_{19}H_{24}O_3$, were obtained. Reduced with Zn and HCl, benz-2-diethyl-5-tetrahydrophenylhydrindene, $C_{19}H_{24}$, b_D^{25} 1.08–9°, d_{20} 0.9475, n_D 1.5274, is formed. X. Pericyclic derivatives of acenaphthene. KARL FLEISCHER and FRITZ SEIFERT. Ibid 317–25; cf. C. A. 7, 3737; 8, 668.—Periacenaphthdiethylindandione could not be reduced with Zn and HCl. HI and red P under pressure (10 hrs. in a sealed tube at 160–70°) gave periacenaphth-6-diethylindene (a), $C_{19}H_{22}$, 6-sided tables, m. 93–5°. When gently boiled with HI and red P, periacenaphth-7-keto-6-diethylindane (B), $C_{19}H_{20}O$, rhombic tables, m. 92–3°, is formed. Further reduction gives A. B may be condensed with $Et_3C(COCl)_2$, yielding acenaphthperi-(7-diethyl-8-ketoindan)- β,β -(4-diethylindan-3,5-dione), $C_{24}H_{28}O_2$, light brown, rhombic plates, m. 146–7°. Reduced by boiling with red P and HI, one keto group is apparently reduced, giving the compound $C_{24}H_{30}O_2$,



gently boiled with HI and red P, periacenaphth-7-keto-6-diethylindane (B), $C_{19}H_{20}O$, rhombic tables, m. 92–3°, is formed. Further reduction gives A. B may be condensed with $Et_3C(COCl)_2$, yielding acenaphthperi-(7-diethyl-8-ketoindan)- β,β -(4-diethylindan-3,5-dione), $C_{24}H_{28}O_2$, light brown, rhombic plates, m. 146–7°. Reduced by boiling with red P and HI, one keto group is apparently reduced, giving the compound $C_{24}H_{30}O_2$,

yellowish white, pointed tables, m. 117°. The H_2SO_4 soln. has a light red color and a brownish fluorescence. $\text{Et}_3\text{C}(\text{COCl})_2$ was also condensed with A, giving *acenaphthperi*-[7-diethyl-8-ketoidan]- β, β -[4-diethyl-5-ketoidan], pale yellow tables, m. 93–4°.

C. J. WEST

Benzilic acid. J. HERZIG AND MARIANNE SCHLEIFFER. Univ. Vienna. *Ann.* 422, 326–32 (1921).— $\text{Ph}_3\text{C}(\text{OAc})\text{CO}_2\text{H}$ (Ber. 22, 1212) is obtained also by the action of Ac_2O and AcONa on $\text{Ph}_3\text{C}(\text{OH})\text{CO}_2\text{H}$. By the addition of Zn dust, $\text{Ph}_3\text{CHCH}_2\text{CO}_2\text{H}$, m. 144–6°, is obtained in small amts.; *methyl ester*, m. 56–9°. Ph_2CO is not attacked by Ac_2O and AcONa . Addition of Zn dust gives $[\text{Ph}_3\text{C}(\text{OH})]_2$. Ph_2CHOH , with or without Zn dust, gives the acetate, m. 39–41°. *Methyl acetylbenzilate*, $\text{Ph}_3\text{C}(\text{OAc})\text{CO}_2\text{Me}$, m. 122–5°.

C. J. WEST

Synthesis of chlorine-free benzoic acid from benzene. I, II. RALPH H. MCKEE AND FRANK A. STRAUSS. Columbia Univ. *Chem. Met. Eng.* 24, 638–44, 697–702 (1921).—After a historical discussion and a consideration of the present process for the manuf. of BzOH , the possibilities of a new com. synthesis from PhSO_3K are considered. The fusion with HCO_2Na is accompanied by so many decompn. products that it was given up. The fusion of PhSO_3Na with NaCN was studied, and it was found that there were 2 main side reactions: the reduction of PhSO_3Na by NaCN and pyrogenic decompn. with the decompn. of the NaCNO formed in the 1st reaction and the consequent liberation of NH_3 . The products identified were: PhOH , Ph_2S , a solid, m. 177–80°, and one m. 158° (Ph_2S_2 ?). The effect of various factors on the reaction were studied. An excess of cyanide serves as an inert diluent and side reactions are depressed to a considerable extent. Sand may also be used as a diluent, the max. results being obtained with 70 %. The reaction temp. may be definitely fixed at 410–5°. The most favorable conditions are summed up as: Temp. 420–430°, atm. pressure, NaCN and PhSO_3Na in equimol. proportions, or slight excess of NaCN , the addition of a certain amt. of inert material (70% 40-mesh sand). Pure NaCN must be used, as a com. product gave only 11.7% PhCN . The hydrolysis of the PhCN is carried out by allowing it to flow into 2.5 times its vol. of hot H_2SO_4 (d. 1.6, 54° B $\acute{\text{e}}$.) at 125–140°. The cost of the raw material is: PhCH_2Cl , bleach process, \$59.90 per 100 lbs.; PhCN method, \$51.56. With a cheap source of NaCN , the proposed source would produce BzOH of a higher degree of purity than the most of the acid on the market today at a lower cost.

C. J. WEST

Iodoamidines. J. BOUGAULT AND P. ROBIN. *Compt. rend.* 171, 38–40 (1920); 172, 452–4 (1921).—A new reaction is described which, apart from the interest it offers from a theoretical standpoint, may be found useful in the sepn. and identification of amidines. When $\text{PhC}(\text{NH})\text{NH}_2\text{HCl}$ in H_2O is treated with alkali and I_2 in KI , a pale yellow, cryst. ppt. seps. out which proves to be an I substitution deriv. of $\text{PhC}(\text{NH})\text{NH}_2$, (A) having the empirical formula $\text{C}_7\text{H}_4\text{IN}_2$. This compd. gives free I with HCl and KI , indicating that its I is joined to N in the form of HOI and not substituted in the C_6H_5 nucleus. B. and R. suggest 2 possible formulas for the compd.: (I) $\text{PhC}(\text{NH})\text{NIH}$ or (II) $\text{PhC}(\text{NI})\text{NH}_2$, and propose to apply the general name of *iodoamidines* to compds. of this new type. The relationship which must exist between these compds. and other I compds. wherein the halogen is also attached to N, and functions as HOI is pointed out. *Benzoyliodoamidine* (B) m. 117° (decompn.), is insol. in H_2O , sol. in alc., Et_2O , C_6H_6 and CHCl_3 . It is very stable in air, thus differing from the hypoidous amides of Boismenu, (cf. C. A. 6, 82, 619), which are stated to be very unstable. Even in soln. the stability of B is great and it can be crystd. from boiling C_6H_6 without alteration. B is attacked by most of the compds. capable of reacting with I, e. g. NaOH in excess gives NaOI and regenerates A, etc. Anisamidine and piperonamidine under the identical conditions as described for A form cryst. iodoamidines which possess the general properties of B. In the second paper B. and R. examine in particular, (1) the action

of Ac_2O on **B** and, (2) the action of **B** on various compds. capable of reacting with nascent HOI. (1) When 4 g. of pulverized **B** are added little by little to 12 cc. Ac_2O a yellow, cryst. ppt. forms, which after washing with C_6H_6 and drying, m. 135° . This compd. is insol. in C_6H_6 and CHCl_3 and sol. in EtOH with decompn. and formation of CHI_3 . Analysis and the properties of the compd. lead to the very unexpected formula $\text{C}_7\text{H}_6\text{N}_2\text{I}_2\text{Ac}_2\text{O}$. The compd. contains more **I** than **B** gives AcOH by the action of H_2O and evidently contains all its **I** in the hypiodous state since it is liberated by $\text{KI} + \text{HCl}$. It is probably a combination of *benzenyldiiodoamidine* (**C**) and Ac_2O . The possible mechanism of the reaction leading to the formation of **C** is suggested, **C** is relatively stable in air but is instantly decompd. by H_2O with the liberation of cryst. **I**. If the latter is driven off by warming on the H_2O bath the remaining soln. on evapn. yields a mixt. of *benzamidine acetate* and *iodate* in proportions corresponding to the formula found by analysis. (2) The characteristic action of **B** on $\text{KI} + \text{HCl}$ led to the idea of employing it as a source of HOI. (a) *Antipyrine*.—When equimol. amts. of **B** and antipyrine are stirred together with dil. AcOH , there is a rapid reaction with a practically quant. yield of *iodoantipyrine*. (b) *Vanillin*.—Similarly, vanillin yields *iodovanillin* almost quant., m. 180° , identical with the compd. obtained by Carles, although the latter assigns to it the m. p. of 174° . If the AcOH is used in insufficient amts. an intermediate product, *benzamidine iodovanillate*, is obtained, refractive prisms, m. 115° (decompn.). (c) *Thymol*.—With thymol, *monoiodothymol* is obtained, identical with that resulting from the action of **I** and HgCl_2 on thymol in alc. In all cases, **A** is recovered from the mother liquors. (3) From an exptl. point of view these compds. must all be considered as derivs. of HOI resulting from the fixation of 1 mol. of HOI followed by the elimination of 1 mol. H_2O . While their origin is the same, their properties, especially the variable stability of the **I**, demand assigning them different formulas. In iodovanillin and iodothymol, the **I** must perforce be considered as attached to **C** but in **B**, considering the instability of the **I** and its greater reactivity, it is held to be fixed to **N**. Iodoantipyrine, on the other hand, presents a still more embarrassing situation. Until recently it was customary to join the **I** to **C** but after it was found to react with KI and HCl similarly to **A** (J. Bougault, *C. A.* 14, 177) its structural formula was modified to correspond to the latter compd. However, it differs from **B** in that it does not react with KI and AcOH . These facts give new proof of the difficulty of establishing strict classifications. Between the types so clearly defined as **B** and iodothymol, iodoantipyrine indicates the possibility of an intermediate series permitting the passage by imperceptible degrees from one extreme to the other. A. T. F.

Catalytic oxidation by unsaturated substances (oils, hydrocarbons). J. BOUGAULT AND P. ROBIN. *Compt. rend.* 171, 353-5(1920); *J. pharm. chim.* 23, 49-51(1921).—When mustard gas in poppyseed oil is exposed to air 12-15 days, crystals of $\text{SO}(\text{CH}_2\text{CH}_2\text{Cl})_2$, m. 112° , are pptd. No such action occurs in direct contact with air, or when mustard gas is dissolved in a satd. oil, e. g. vaseline. With oil of turpentine, oxidation takes place more rapidly, and is quant. Other unsatd. oils act similarly. To be effective, the substance to be oxidized must be sol. in the catalyst, and the end product insol. Thus, thiodiglycol, $\text{S}(\text{CH}_2\text{CH}_2\text{OH})_2$ (insol. in oils and oil of turpentine), when dissolved in citral (5 g. : 30 g.) is oxidized to $\text{SO}(\text{CH}_2\text{CH}_2\text{OH})_2$. Crystals m. 111° appear after 20 days; after 10 weeks, 1.5 g. was obtained. Such processes probably take place in the economy of animals and plants. S. WALDBOTT

The preparation of fatty acids by oxidation of paraffins. R. FABRE. *J. pharm. chim.* 23, 94-8(1921).—A summary of the work done on this subject (cf. *C. A.* 14, 2343, 3787; 15, 90, 301, 374).

The action of ammonia on phenylpyruvic and benzylpyruvic acids. M. J. BOUGAULT. *Bull. soc. chim.* 29, 47-53(1921); cf. Erlenmeyer, *Ann.* 307, 149(1899).—*Phenylglyoxylphenylalanine*, $\text{PhCH}_2\text{CH}(\text{CO}_2\text{H})\text{NHCOCOPh}$, is obtained in 2 g.

yield, together with small amts. of BzOH and PhCOCO_2H , when 5 g. $\text{PhCH}_2\text{CH}(\text{CO}_2\text{H})\text{NHCOCH}_2\text{Ph}$ is treated in the cold and on long standing with alk. KMnO_4 , m. 118° , sparingly sol. in H_2O or C_6H_6 , sol. in alc. or Et_2O ; alk. hydrolysis yields $\text{PhCH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$ and PhCOCO_2H . *Semicarbazone*, m. about 212° (decompn.). *Amide of phenylpropionylbenzylalanine* (A), $\text{Ph}(\text{CH}_2)_2\text{CH}(\text{CONH}_2)\text{NHCO}(\text{CH}_2)_2\text{Ph}$, prepd. by heating $\text{PhCH}_2\text{COCO}_2\text{H}$ or related compds. which give this in presence of alkalis ($\text{PhCH}_2\text{CHCH}(\text{OH})\text{CO}_2\text{H}$, $\text{PhCH}_2\text{CHCH}(\text{OH})\text{CONH}_2$, a compound $\text{PhCH}_2\text{CH}_2\text{C}(\text{OH})(\text{CONH}_2)\text{OC}(\text{OH})(\text{CO}_2\text{H})\text{CH}_2\text{CH}_2\text{Ph}$ (cf. C. A. 7, 1486) or its diamide) with NH_4OH , needles from alc., m. 185° , insol. in H_2O , CHCl_3 , or Et_2O . *Phenylpropionylbenzylalanine*, obtained by alk. hydrolysis of A or by heating PhCOCO_2Na with NH_4OH , needles from C_6H_6 , m. 180° , insol. in H_2O , slightly sol. in Et_2O , more sol. in Me_2CO ; acid hydrolysis yields $\text{Ph}(\text{CH}_2)_2\text{CO}_2\text{H}$ and $\text{Ph}(\text{CH}_2)_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$.

H. GILMAN

The indication of acid and basic function and their quantitative determination. I. M. KOLTHOFF. Univ. Utrecht. *Rec. trav. chim.* 39, 672-6(1920).—Recently Waterman and Groot (C. A. 15, 363) have detd. the acid or basic function of a compd. by detg. its influence on the velocity of hydrolysis of cane sugar by HCl of a definite concn. The method gives qual. results and depends indirectly on the concn. of the H and OH ions. Similar results may be obtained simply by the use of indicators. For compds. giving dissociation consts. above 10^{-10} conductometric titration may be used. In using the method of indicators a detd. amt. of HCl (less than 1 equiv.) is added to the basic compd. and the H-ion concn. detd. with indicators on the basis of equations given. For acids like phenol and resorcinol NaOH is added. The results obtained with phenol, resorcinol, aniline, semicarbazide and glycine are given and confirm the data in the literature, which is here reviewed. In the conductometric titration the NH_2 group as well as the CO_2H group of NH_2 acids may be detd. separately by adding HCl and NaOH , resp. When the const. of dissociation of a compd. is less than 10^{-12} the neutralization curve no longer gives by the conductometric titration any indication of the power of the compd. to unite with an acid or a base. By adding indicators by which this can be demonstrated the const. of dissociation can be calcd. from the cond. of the compd. in mixtures of the compd. with an acid or a base. K. thus detd. the dissociation const. of sucrose, glucose, lactose, glycerol, mannitol, antipyrine, urea, and other substances of which the const. is of about the same order as that of H_2O . Details on the latter results are not given.

E. J. WITZEMANN

The three tetrachlorobenzenes, pentachlorobenzene and hexachlorobenzene; their reaction with sodium methylate. A. F. HOLLEMAN. Univ. Amsterdam. *Rec. trav. chim.* 39, 736-50(1920).—This paper completes H.'s work of the Cl derivs. of C_6H_6 (C. A. 10, 1508; 13, 569). *1,2,4,5-Tetrachlorobenzene* (A) (with C. VAN DER HOEVEN). This compd. was easily obtained by treating C_6H_6 with Cl in the presence of 0.5% Fe powder. 78 g. C_6H_6 were treated with 284 g. Cl (detd. by absorbing the HCl evolved in H_2O and detg. the increase in wt.). After about 100 g. Cl has been added $p\text{-C}_6\text{H}_4\text{Cl}_2$ seps., after which the mass is heated on the H_2O bath. The prepn. from $p\text{-C}_6\text{H}_4\text{Cl}_2$ is simpler: 284 g. are melted on the H_2O bath, 3 g. Fe powder are added and 284 g. Cl as above. The absorption is easy and complete in three days. The crystals of A were distd. *in vacuo*, crystd. from C_6H_6 and then from ligroin. 170 g. A, m. 138° , were obtained. In replacing 1 atom of Cl in A with OH or OMe no isomers are obtained since all 4 Cl atoms are equiv. 5.4 g. A were heated with 55 cc. 0.5 N NaOMe in the sealed tube for 12-13 hrs. at 180° . The alk. soln. was distd. with steam and gave crystals of 2,4,5- $\text{Cl}_3\text{C}_6\text{H}_2\text{OMe}$ (B) and some unchanged A when the COMe_2 soln. was allowed to evap. This crystn. was repeated until B was free from A and was fully identified. The alk. liquor from the steam distn. was acidified and distd. with steam and gave 2,4,5-trichlorophenol, m. 66° ; the odor is less intense than that of the dichlorophenols having OH ortho to Cl; the *benzoate* was obtained as shining long needles. *1,2,4,6-Tetrachloro-*

benzene (C) (with VAN DER HORVEN). 2,4,6- $\text{Cl}_3\text{C}_6\text{H}_2\text{NH}_2$ (D) was best prepd. as follows: 100 g. PhNH_2 in 600 g. CCl_4 was satd. with Cl and poured into 100 cc. 25% HCl. A current of steam was then passed. Finally the soln. was rendered basic and again distd. with steam. The oily distillate was fractionated and the low boiling part treated again as above. 2 operations yielded 100 g. D. 19.6 g. D in 100 cc. 25% HCl were treated with 7.5 g. NaNO_2 at about 10° . The soln. was filtered and treated with a boiling soln. of 25 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ + 12 g. NaCl + 6.5 g. Cu powder in 100 cc. 25% HCl + 100 cc. H_2O . When H_2 ceased to be evolved 12 g. C (m. 51°) were removed by steam distn. On treating C with NaOMe soln. as with A a trichloroanisole (E), m. 82° , was obtained. The corresponding trichlorophenol (F) could not be crystd. but gave a benzoate, m. 103° . E treated with HBr gave a phenol of which the benzoate m. 103° . By exclusion F was shown to be 2,3,5-trichlorophenol and E, therefore, the corresponding anisole. Incidentally 3,4,5- $\text{Cl}_3\text{C}_6\text{H}_2\text{NH}_2$ was converted into 3,4,5-trichlorophenol, shining needles, m. $118-9^\circ$. 1,2,3,4-Tetrachlorobenzene (G) (with C. VAN DER HORVEN AND F. E. VAN HAEFTEN). Although A and C were easily obtained G was prepd. only with difficulty. Several methods were tried and 2 are described here. In nitrating *p*- $\text{Cl}_2\text{C}_6\text{H}_4$ 3 isomers are formed: 1,4,2,6-, 1,4,2,3- (H) and 1,4,2,5- $\text{C}_6\text{H}_2\text{Cl}_2(\text{NO}_2)_2$. Of these H may be sepd. by crystg. the mixt. from EtOH (den Hollander, C. A. 13, 3154). When H is treated with NH_3 -EtOH on the H_2O bath 1 NO_2 is replaced with NH_2 and this dichloronitroaniline diazotized in strong acid soln. gives G at once. The other method is given by the following scheme: $3,6\text{-Cl}_2\text{C}_6\text{H}_2\text{NO}_2 \rightarrow \text{Cl}_2\text{C}_6\text{H}_2\text{NHAc(I)} \rightarrow 3,6,2\text{-Cl}_3(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{NHAc(II)} \rightarrow \text{Cl}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{NH}_2 \rightarrow 1,2,3,4\text{-C}_6\text{H}_2\text{Cl}_4$. This method is not difficult but the yield in nitrating I to obtain II is only 13%, which limits the method. G is attacked more easily by NaOMe than A. 5.4 g. in 55 cc. of 0.5 N NaOMe had reacted completely in 6.5 hrs. at 180° in the sealed tube. The alk. soln. distd. with steam gave an oily distillate having the intense odor of *vic*-dichlorophenol (C. A. 13, 569). The distillate was extd. with C_6H_6 and removed from C_6H_6 by extg. with 10% alkali and pptg. with HCl. The trichlorophenol (I) sepd. as white needles from petr. ether, m. 55° . Because of difficulty of purification I was converted into the benzoate, m. 90° . 2 isomers of I may be formed, both of which are unknown. From 2,3,4- $\text{Cl}_3\text{C}_6\text{H}_2\text{NH}_2$ the 2,3,4-trichlorophenol (J) was obtained as the benzoate, shining needles, m. 141° . It follows that I is 2,3,6-trichlorophenol. The anisole obtained from G gave J on treatment with 48% HBr for 5 hrs. at $180-90^\circ$ and was identified as the benzoate, m. 141° . From the standpoint of steric hindrance it is remarkable that the OMe group between 2 Cl atoms in the anisole of I should be attacked and not that from which J was obtained. The ease of benzylation was observed to be reversed for these 2 compds. Pentachlorobenzene (K) (with C. VAN DER HORVEN). K is formed in small amt. by the chlorination of C_6H_6 as described above. The chlorination was continued until much A sepd. This was filtered off and the blackish oil purified by a steam distn. in which C_6Cl_6 remains behind. The distillate was fractionated: most distd. at atm. pressure at $200-30^\circ$; a 2nd fraction b_p 165° and a 3rd b_p $165-90^\circ$. The latter sepd. crystals which, purified from EtOH, proved to be K. This method gave poor results. Better results were obtained by using A. 50 g. A were boiled 0.5 hr. with 250 g. HNO_3 (d. 1.52). The cold mixt. was poured into H_2O . The mono- NO_2 compd. was sepd. from the little chloranil formed by dissolving in ligroin; yield of mono- NO_2 deriv., 57 g. The 57 g. in 3 l. H_2O were treated with 40 g. Fe powder and slowly with 50 g. concd. HCl at 70° . This required 2 or 3 days of 8 hrs. The $\text{Cl}_2\text{C}_6\text{H}_2\text{NH}_2$, m. 110° (not 90°) was sepd. by steam distn. of the alk. soln.; yield 46 g. Since this aniline is a very weak base diazotization was done in $\text{HNO}_3\text{-H}_2\text{SO}_4$. 17 g. NaNO_2 were dissolved in 294 g. concd. H_2SO_4 cooled with ice. The soln. was then heated 3-4 hrs. at 80° and after cooling the 46 g. of the aniline were added. The viscid turbid liquid was heated on the H_2O bath and when the viscosity and turbidity were lost the soln. was poured into a soln. of 54 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ +

27 g. NaCl + 225 g. H₂O + 450 cc. 38% HCl + 15.8 g. Cu powder. **K** was filtered off in nearly calcd. yield, m. 86°. With NaOMe **K** gave a Cl₄C₆H₂OH (**L**), m. 115°, not identical with the 1 (of possible 3) known tetrachlorophenol. 2,3,5,6-Tetrachlorophenol was synthesized from the corresponding aniline and found to be identical with **L**. The anisole of **L** was readily obtained with 2.5 *N* NaOH + Me₂SO₄; needles, m. 88°. **L** was the main product but some 2,3,4,5-tetrachlorophenol was sepd. as the benzoate, m. 110°. C₆Cl₆ was obtained as a by-product above, m. 226°. With NaOMe much of it remained unattacked but C₆Cl₅OMe and C₆Cl₅OH, m. 186°, were obtained. The quantity of Cl liberated by 1 equiv. of NaOMe from 5 millimols. of the C₆H₅ deriv. in 3 hrs. at 176° (cf. *C. A.* 13, 669) was detd. (1) *m*-Cl₂C₆H₃ liberated 0.048 millimols. or 1.0%; (2) *sym*-C₆H₃Cl₂ 2.50 millimols. or 50.0%; (3) 1,2,3,4-C₆H₂Cl₄ 3.04 millimols. or 60.8%; (4) 1,3,4,5-C₆H₂Cl₄ 4.19 millimols. or 83.8%; (5) 1,2,4,5-C₆H₂Cl₄ 3.86 millimols. or 77.2%; (6) C₆HCl₅ 3.89 millimols. or 77.8%; (7) C₆Cl₆ 3.57 millimols. or 71.4%. It is well known that in chloronitro derivs. the Cl atoms can be replaced only when they are *o*- or *p*- to NO₂ groups. In the dinitrobenzenes and chlorodinitrobenzenes 1 of the NO₂ groups only is mobile when it is *m*- to another NO₂ group. In the chlorobenzenes, on the contrary, the *m*-position of the Cl atoms renders one of them substitutable.

E. J. WITZEMANN

The stereoisomeric components of α -sulfofropionic acid. A. P. N. FRANCHIMONT AND H. J. BACKER. Univ. Leyden and Groningen. *Rec. trav. chim.* 39, 751-7(1920).—Only a few compds. of simple constitution have been sepd. into their active components. α -Sulfofropionic acid was sepd. by prep. the acid strychnine salt. In this way a less sol. fraction which sepd. from aq. soln. as large crystals was obtained and a more sol. fraction which was recrystd. first from abs. EtOH and then H₂O. The strychnine was sepd. with Ba(OH)₂ and from the active Ba salts obtained, the active free acids were liberated with H₂SO₄. The mol. rotations were 49.5° and -49.5°, resp. The acid barium salts had mol. rotations of 41° and -41°. For the acid salts of strychnine the rotation is nearly equal to the sum of the rotation of the ordinary salts of strychnine (112°) and that of the acid sulfofropionates, being -72° and -152°, resp. The neutral Ba salts are peculiar in that their rotation differs notably from that of the acids not only in value but in sign; thus the neutral Ba salt of the *d*-acid has a mol. rotation of -14° while the same salt of the *l*-acid has 14° rotation. It is concluded that the neutralization of the strongly acid SO₂H group has only a secondary influence upon the rotation while neutralization of the CO₂H function causes a change in the sign of the rotation. The neutralization of lactic acid also causes a change in the sign of the rotation. The sulfofropionic acids were little sensitive to racemization tests. At high temps., especially in alk. soln., the racemization takes place.

E. J. WITZEMANN

Replacement of substituents in the benzene ring. V. The six trichloronitrobenzenes and the three trinitrobenzenes; their reaction with sodium methylate. A. F. HOLLEMAN AND F. E. VAN HAEFTEN. Univ. Amsterdam. *Rec. trav. chim.* 40, 67-98 (1921).—*Prepn. of the 6 trinitrobenzenes.*—The 6 isomers are already described in the literature but the method of prepn. was improved in several instances and the details are here given. *Qualitative results on the action of NaOMe on the trichloronitrobenzenes.*—The methods used in this reaction were described previously (*C. A.* 15, 65). In this case the reaction is much slower than with the dichlorodinitrobenzenes so that heating some hrs. on the H₂O bath is necessary. 15 g. 2,3,4-Cl₃C₆H₂NO₂ (**A**) after heating with 105 cc. 0.4755 *N* NaOMe soln. 5 hrs. in an autoclave at 110° were poured into H₂O and filtered. The product was distd. with steam and on crystn. from EtOH gave 3,4,2-Cl₂(O₂N)C₆H₂OMe, silky needles, m. 72.5°, identical with that obtained by d. Hollander (*C. A.* 15, 65). 5 g. 3,4,5-Cl₃C₆H₂NO₂ (**B**) heated 6 hrs. under a condenser on the H₂O bath with 52 cc. NaOMe (0.47 *N*) gave after evap. most of the

MeOH and pouring into H_2O a solid which from EtOH gave silky needles with a green reflex, m. 98° , identical with the $Cl_3(O_2N)C_6H_3OMe$ obtained by d. H. (*l. c.*) from 1,3,2,5- $Cl_4H_2Cl_2(NO_2)_2$. 20 g. 2,5,6- $Cl_3C_6H_2NO_2$ (C) were heated with 210 cc. NaOMe (0.47 N) 24 hrs. on a H_2O bath under a condenser and after evap. most of the MeOH the mixt. was poured into H_2O and filtered. The oil sepd. was distd. with steam and gave colorless crystals of 3,4,2- $Cl_3(O_2N)C_6H_3OMe$, m. 128° . The main portion gave crystals of 2,5,6- $Cl_3C_6H_3OMe$, m. 42.8° . 5 g. 2,4,5- $Cl_3C_6H_2NO_2$ (D) were heated with 52 g. NaOMe (0.47 N) for 6 hrs. on the H_2O bath and gave a 2,5,4- $Cl_3(O_2N)C_6H_3OMe$, m. 101° , identical with that obtained from 1,4,2,5- $Cl_4H_2Cl_2(NO_2)_2$. Beilstein and Kurbatow (*Ann.* 192, 23(1878)) found that with NH_3 the Cl ortho to the NO_2 group is replaced. 2,3,5- $Cl_3C_6H_2NO_2$ (E) with NaOMe gave the same anisole, m. 44° , obtained by d. H. from 1,3,5,6- $Cl_4H_2Cl_2(NO_2)_2$. 6 g. 2,4,6- $Cl_3C_6H_3NO_2$ (F) heated 6 hrs. with 65 cc. NaOMe on the H_2O bath gave an anisole, m. 72.5° , which by arguments based on analogy is said to be 2,4,6- $Cl_3(MeO)C_6H_2NO_2$. *Quantitative researches.*—The methods used were the same as those used by d. H. (*l. c.*) and the numerical results are given in tables. *Discussion of results.*—The numerical results are summarized in several tables. The reaction consts. at 0° of chloronitrobenzenes, dichloronitrobenzenes, trichloronitrobenzenes and chlorodinitrobenzenes increase in the same order. The Cl atom which leaves the ring is always *o*- or *p*- with respect to the NO_2 group. In each group of isomers the largest const. of reaction is obtained for that compd. in which the Cl atom which leaves is in the *p*-position with respect to the NO_2 group which it renders mobile. When another Cl atom is placed *o*- or *p*- to the Cl atom which leaves the mobility of the latter is increased. The conclusion of d. H. (*l. c.*) that in *m*- $Cl_2C_6H_4(NO_2)_2$, *m*- $Cl_3C_6H_3NO_2$ and *sym*- $Cl_3C_6H_3NO_2$, which are inert toward NaOMe, any of the substituents is rendered mobile by the introduction of a NO_2 group or a Cl atom, was fully confirmed. When one introduces a substituent it is always this which reacts with NaOMe. C and F showed the smallest velocity of reaction. The same is true of 2,6- $Cl_2C_6H_3NO_2$, showing that a NO_2 group placed between 2 adjacent Cl atoms detrs. a very slow velocity of substitution. The fact that the velocity with C is less than with F shows that the presence of 3 Cl atoms adjacent diminishes the liberating activity of a NO_2 group. The examn. of the products of the transformation of C with NaOMe shows that in this isomer the NO_2 group is changed in character. Comparison of the results for isomers of $Cl_2C_6H_2NO_2$ and $Cl_3C_6H_2NO_2$ shows that the latter behave more like $Cl_2C_6H_3NO_2$ derivs. than like $Cl_3C_6H_2NO_2$ derivs. The quant. conclusions are among the parts of the paper that cannot be adequately abstracted. *Prepn. of isomeric trinitrobenzenes.*—The details of the prepn. of the 1,2,4-(G), 1,2,3-(H), and 1,3,5-trinitrobenzenes (I) are given here, although all were previously known. 5 g. H with 55 cc. 0.47 N NaOMe reacted at room temp. and after 0.5 hr. on the H_2O bath and after standing 24 hrs. sepd. 2,6-(O_2N) $_2$ C_6H_3OMe , m. 118° . 5 g. G treated similarly gave 2,4-(O_2N) $_2$ C_6H_3OMe , m. 88° . 5 g. I treated similarly gave 3,5-(O_2N) $_2$ C_6H_3OMe , m. 105° . Data on quant. measurements of the same reactions are given.

E. J. WITZEMANN

The identification of sulfonic acids in the state of salts formed with aromatic bases. C. F. VAN DUIN. Univ. Utrecht. *Rec. trav. chim.* 40, 99-102(1921).—Ambler (*C. A.* 15, 55) described the prepn. of difficultly sol. salts of various naphthalenesulfonic acids of aromatic bases as a method of identifying these acids. Since v. D. has been working with such salts he briefly describes them here. Franchimont and Backer (*C. A.* 15, 1509) among others have used this method. These salts are converted into the free acids by treating them with 1 equiv. of $Ba(OH)_2$ and then pptg. the Ba with H_2SO_4 . v. D. has found that the Ba salt is obtained also by boiling with a suspension of $BaCO_3$. The aromatic bases were weak bases that do not color with phenolphthalein, such as $PhNH_2$ and *p*- $H_2NC_6H_4Me$. These salts were obtained by adding the HCl salt

of the base to a soln. of the SO_2H acid or its salt in concd. soln. and analyzing by titrating with alkali and phenolphthalein. $o\text{-MeC}_6\text{H}_4\text{SO}_3\text{H}$ gives a PhNH_2 salt as hard leaves, m. 218° ; the $p\text{-H}_2\text{NC}_6\text{H}_4\text{Me}$ salt seps. as colorless needles, m. $203\text{--}4^\circ$. The p -acid gives a PhNH_2 salt as colorless needles, m. 237° , while the $p\text{-H}_2\text{NC}_6\text{H}_4\text{Me}$ salt forms hard leaves, m. $199\text{--}200^\circ$. $4,3,5\text{-Me}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{SO}_3\text{H}$ gave a PhNH_2 salt as cream-colored spangles, while the $p\text{-H}_2\text{NC}_6\text{H}_4\text{Me}$ salt m. 251° after darkening at 247° . Sulfanilic acid gave the 2 salts the latter of which m. above 300° . $\beta\text{-C}_{10}\text{H}_7\text{SO}_3\text{H}$ gives a PhNH_2 salt, colorless needles or leaves, m. $267\text{--}8^\circ$ (decompn.), after scorification at 260° . Toluene-2,4-disulfonic acid gave a $p\text{-H}_2\text{NC}_6\text{H}_4\text{Me}$ salt as hard crystals, m. 277° (decompn.).

E. J. WITZEMANN

Salt formation of dicarboxylic acids with aniline and its homologs. T. SABALITSCHKA AND M. DANIEL. *Ber. pharm. Ges.* 30, 481-3 (1921).—Substantiating the findings of Anselmino (cf. *Ber. pharm. Ges.* 13, 494) that succinic acid yields with PhNH_2 or toluidine only acid salts, S. and D. show by additional expts. similar behavior in the case of fumaric and maleic acids.

W. O. E.

Urethans of thymol and carvacrol. D. C. L. SHERK. *Am. J. Pharm.* 93, 115-125, 207-22 (1921); cf. *C. A.* 15, 920.—The prepn. of urethans is an addition reaction between an alc. hydroxyl and an isocyanate: $\text{C}(\text{:O})\text{:NPh} \longrightarrow \text{C}(\text{:O})\text{:NPh}-\text{R}'\text{OHR}'\text{OC}(\text{:O})\text{:}$

NHPh , forming an ester of $\text{NH}_2\text{CO}_2\text{H}$. Applying the method of Weelhuizen (*C. A.* 13, 708) S. introduced 5.28 g. of thymol with 4.6 g. PhNCO (10% excess) into an acetylation flask. The mixt. became cold. To this were added 20 cc. petroleum (b. $170\text{--}200^\circ$) and the mixt. was heated 1 hr. The cooled reaction mixt. deposited crystals which, washed with two 5-cc. portions of petroleum (yield was 6.75 g.) and crystd. twice from 95% alc., m. $106.5\text{--}107^\circ$. It does not cryst. well from C_6H_6 on cooling, and does not ppt. on addition of heptane. 5.04 g. carvacrol treated in the same way yielded 7.77 g. urethan, m. 138° after crystn. from alc. The hot C_6H_6 soln. sets to a mush on cooling and the product m. at $133.5\text{--}4.5^\circ$. Addition of an equal vol. of heptane to these mother liquors gave a copious deposit of crystals, m. 138° . Application to hydrothymoquinone: Since quinol yields a diurethan, thymoquinol was treated with 2 mols. of PhNCO in slight excess and heated in petroleum (10 cc. per g. of phenol). The phenol melted on warming and gave a clear soln., which after about 15 min. heating began to deposit spherules about 1 mm. in diam.; 2 g. of phenol yielded 4.765 g., m. $229\text{--}230^\circ$. In another expt. with 4 g. phenol, reaction took place at once on addition of the isocyanate even before diln. with petroleum or heating because a residue formed which later was found to be insol. in the boiling reaction mixt. From this mixt. 9.25 g. product were recovered. These high yields indicate that both HO groups react and that a diurethan results. This is also wholly indifferent towards cold alkali, indicating the absence of HO groups. The product is only slightly sol. in C_6H_6 and hot 95% alc. and only very slightly sol. in AcOEt , CHCl_3 , CCl_4 . Acetone dissolves it readily, giving on evapn. hexagonal plates with one elongated axis. In the extension of this work to the use of $\alpha\text{-C}_{10}\text{H}_7\text{NCO}$ as a reagent the method of Weelhuizen was used. The same procedure was followed as in the other cases. The yields with this reagent were not so good. Perhaps a greater soly. in the petroleum accounts for this, because after sepn. of one crop of crystals and reheating only a very little more came down. With PhNCO the intensity of the odor was a gage of the completeness of the reaction, but that advantage was lost here. To conserve the reagent the phenols were taken in slight excess in these reactions. Dibenzoylthymoquinol was produced by the Schotten-Baumann method from the phenol in the theoretical quantity of 15% NaOH and a sufficient quantity of BzCl to leave an odor at the end. By Brandel's (KREMMERS AND BRANDEL, *Pharm. Rev.* 22, 250 (1904)) modification of the method of prepn. nitrosocarvacrol and nitrosothymol, it is possible to obtain metallic derive, of nitro-

sophenols in 95 and 96% yields, resp. The derivs. of the heavy metals formed amorphous ppts.: Pb yellow, Ca yellowish red, Cu bright green, Zn yellowish white, Cd reddish yellow and Ag deep red. For the prepn. of alkali derivs. the corresponding nitrosophenol was dissolved in the theoretical quantity of 2 N CO_2 -free alkali and allowed to evap. to dryness in a vacuum desiccator. The Na deriv. of carvacrol forms the most readily and is of the finest appearance. It is immediately crystd. by pptn. from ether and dries as a splendid, brown-maroon powder. The thymol deriv. comes out amorphous at first, but quickly becomes cryst. and gives needles of much the same color, cementing to lumps on filtration and drying. The K compds. give aq. solns. of much the same color, but blue solids from water and ether. They appear as amorphous oils and the thymol compd. crystallizes most readily, contrasting with Na in this. It comes out easily. Bz derivs. of nitrosophenol were prepd. by the Schotten-Baumann reaction, with $1/40$ mol. of reacting substances: 4.5 g. nitrosophenol, 3.5 g. BzCl , 1 g. NaOH . The nitrosophenol in the equiv. quantity of 10% NaOH was treated with BzCl with shaking till an odor persisted to ensure an excess. The thymol compd. is bright yellow with an orange tint, which deepens on exposure (it is somewhat sensitive in this respect) and forms thick needles, m. 105° , and after freezing at 97 – 105° the yield was 82%. It is readily sol. in heptane, and crysts. out as a mush of pale yellow crystals. The soln. in alc. is deep orange, almost brown, but somewhat lighter in heptane. The alc. soln. develops an odor of BzOEt showing that alcoholysis takes place. The carvacrol compd. forms rectangular plates with bevelled edges of bright yellow color with orange tint, stable in air. It is more sol. than the thymol compd. The alc. soln. is deep orange to brown and develops an odor of BzOEt . The soln. in heptane is brownish and deposits on cooling or evapn. yellow prisms. The brilliant color of these products resembles that of thymoquinone so strikingly that the ketone structure was suggested for them. These compds. should prove more useful for purposes of identification of these two phenols than the NO compds. themselves. These may be derived from the NO compds. in one step. They are easily purified, slightly sensitive to light and air only when moist, and are stable at the m. p. The difference in m. ps. is 22° compared with the difference of 9° between the NO compds., which are unstable at that point, and nitrosothymol scarcely has a m. p., unless it has been very carefully purified. It is impossible to sep. these compds., and thus thymol and carvacrol in the presence of each other cannot be distinguished. With more stable compds. like the Bz or similar derivs. a sepn. may become possible. The cryst. forms of the Bz derivs. are strikingly different also. In view of the fact that the ketone structure has been assigned arbitrarily to these derivs., which the similarity in color with thymoquinone supports, an attempt was made to prep. an oxime. The mol. quantities, (0.01 mol.) were used. First the Bz deriv. in alc. was treated with $\text{NH}_2\text{OH} \cdot \text{HCl}$ and KOH . Next the reaction was carried out in heptane soln. with Na_2CO_3 to liberate the NH_2OH . It was found that the Bz deriv. of carvacrol reacts to form the oxime, while that of thymol does not, but is hydrolyzed, regenerating the original nitrosothymol under the same conditions. This accounts for the NH_2OH remaining in the residual salts of the thymol reaction mixt. Since, therefore, the NO compd. exists, the red-brown color with the alkalis is due entirely to this; and carvacrol, because it behaves similarly, must be broken down to the NO deriv. by alkali. It is very interesting to note that apparently nitrosothymol and not nitrosocarvacrol results by this decompn. The formation of alkyl ethers from the different metallic NO derivs. was undertaken in an attempt to differentiate between the two possible types. Since the nitrosophenols may exist in two forms ethers should exist in two forms also by replacement of the H by an alkyl radical. The reaction was carried out with the alkali derivs. in alc. Carvacrol gave a yield of KI of 87%; while that for thymol was lost. The oil obtained from carvacrol solidified. The compd. is probably the oxime ether. The crystals

were pressed between paper; they m. 39° and were stable up to 144° . They were bright yellow or orange needles. The oil from thymol remained liquid. The K derivs. of the nitrosophenols were shaken with MeI in heptane. The odor of the iodide persisted for several days and no perceptible change took place in the alkali deriv. The thymol finally changed to a pale, fluffy powder, but the carvacrol remained as a heavy dark ppt. After several weeks in contact with the heptane soln. of MeI, the heptane gradually acquired a reddish color and the residue changed, losing its dark, almost black color and forming an adherent ppt. Apparently the reaction was taking place with formation of colorless KI.

W. G. GAESSLER

The chemistry of terpenes and essential oils. J. FRÈRE. *Rev. prod. chim.* **24**, 37–45, 77–82, 109–14 (1921).—Review of the progress accomplished from 1916 to 1919, being a translation of an article by A. Reclaire and F. Rochussen in *Chem. Zig*. (C. A. **15**, 571) completed by references taken from Fr. patent specifications and journals and especially from C. A. for 1917–1919.

A. P.-C.

The industrial synthesis of alcohols. ANON. *Rev. prod. chim.* **24**, 149–53 (1921).—Description of the Carleton Ellis process for the prepn. of iso-Pr alc. from petroleum still gases (cf. C. A. **15**, 865, 866, 944) and of the process used by the Skinninggrove Iron Co. for the manuf. of EtOH from C_2H_4 in coke-oven gases (Brit. patent 147,360. Cf. C. A. **14**, 826, 3147).

A. P.-C.

Synthesis of bibasic acids by the action of malonic acid on hydrols. Replacement of the hydroxy-group by the group $CH(CO_2H)_2$. R. FOSSE. *Ann. chim.* **13**, 154–83 (1920); cf. C. A. **14**, 1963.—A more detailed account of work already published (cf. *Bull. soc. chim.* **35**, 1005–17 (1906) and C. A. **1**, 1718).

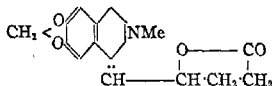
J. C. S.

The action of pyrrolidonecarboxyl chloride on leucine ethyl ester. EMIL ABDEGHALDEN AND HANS SPINNER. *Z. physiol. Chem.* **107**, 1–6 (1919).—The pyrrolidonecarboxyl leucine ester described by A. and Wurm (C. A. **7**, 1370) is found to be a mixt. The pure ester was prepared by treating *dl*-leucine Et ester in $CHCl_3$ with *dl*-pyrrolidonecarboxyl chloride. After distn. of the $CHCl_3$, the sirup was extd. with abs. alc., and the Cl removed by adding a calcd. quantity of Na and ppts. with alc. The filtrate was evapd. in a vacuum at $35\text{--}40^{\circ}$, and extd. with light petroleum. The residue was then dissolved in EtOAc. This soln., on concn., yielded small, colorless needles, which, on purification, were found to be *glutaminyl leucine ethyl ester*, $C_{13}H_{21}O_4N_2$, m. $120\text{--}2^{\circ}$. The filtrate, on being further concd., yielded an orange-red sirup and oblong leaflets. The sirup was extd. with ether, and the leaflets were collected and found to be *pyrrolidonecarboxyl leucine ethyl ester*, $C_{12}H_{19}O_4N_2$, m. $147\text{--}8^{\circ}$. *l*-Leucine methyl ester was prepd. by treating *l*-leucine ($[\alpha]_D^{20}$ 15.83 $^{\circ}$) suspended in MeOH with HCl and then boiling for $1/2$ hour. The MeOH was removed by distn. in a vacuum, and the residue dissolved in water. The aq. soln. was then extd. with ether in the presence of NaOH, and from the ext. after removal of the ether the ester remained, b_D^{20} 79–9.5 $^{\circ}$, d_{20}^{20} 0.9533, $[\alpha]_D^{17}$ 16.52 $^{\circ}$.

J. C. S.

Constitution of lycorine (=narcissine). K. GORTER. *Bull. Jard. bot. Buitenzorg*, (iii), **2**, 1–7 (1920); cf. C. A. **14**, 3699.—Lycorine was obtained from the bulbs of *Crinum giganteum* in a yield of 0.1–0.18% of the fresh material. Ewins' (narcissine) formula, $C_{26}H_{41}O_4N$ (C. A. **5**, 1596), was confirmed; $[\alpha]_D^{20}$ -120° . The hydrochloride, m. 206° , is sol. in 20 parts of water at 26° . The mercurichloride, the picrate, and the perchlorate decomp., resp. at 149, 196, and 230° . Asahina and Sugii (C. A. **8**, 677) found that lycorine when heated with phloroglucinol and H_2SO_4 gives a reddish brown ppt. indicating the presence of a methylenedioxy group, already surmized by Ewins. Gorter has applied this reaction quant. by heating lycorine on the water bath with 30% H_2SO_4 with and without resorcinol; the difference between the wts. of the two ppts. corresponds roughly with that calcd. for formal resorcinol from one methylenedioxy group. The above facts, and the blue fluorescence produced on adding a few drops of $KMnO_4$

to lycorine sulfate soln., suggested a relationship to hydrastine, further emphasized by the opposite sign of the sp. rotations of the free base (-120°) and of the hydrochloride ($+43^\circ$). With H and PdCl_2 , lycorine is reduced to *dihydrolycorine*, $\text{C}_{16}\text{H}_{19}\text{O}_4\text{N}$, prisms, m. 247° , yielding a sparingly sol. *nitrate*, m. 243° . The reduced base is not made fluorescent by KMnO_4 ; whence G. concludes that the HO of the supposed lactonic side-chain is not adjacent to the isoquinoline nucleus, as in hydrastine, but rather that the fluorescence of lycorine is due to a double linking adjacent to this nucleus. Oxidation of lycorine with KMnO_4 gave a small quantity of hydrastic and of oxalic acids, but no succinic acid, which leads G. to choose the annexed among various possible formulas.



J. C. S.

Color and chemical constitution. IV. The remaining phthaleins. JAMES MOIR. *Trans. Roy. Soc. S. Africa* 7, 183-8(1919); cf. *C. A.* 13, 3173.—Further wave-length measurements of absorption bands are communicated for a number of derivs., several new, of *p,p'*- and of *o,p'*-phenolphthaleins, and of 4'-hydroxydiphenylphthalide. Quant. conclusions are derived as to the % increase in wave length of the absorption band of phenolphthalein due to the introduction of various substituents. In agreement with the view previously put forward as to the existence of secondary bands of the phthaleins with a wave length $\frac{1}{2}$ that of the visible band, phenolphthalein and thymolphthalein in alk. solns. exhibit bands of which the edges are at λ 380 and λ 420, resp. The center of the band for *p*-cresolphthymolphthalein in alk. soln. is at λ 595, while the value calcd. from those for phenol-*p*-cresol- and phenolphthymolphthaleins is λ 597. By condensation of 5-bromoguaiaacol with hydroxybenzoylbenzoic acid, the Br atom is eliminated and phenolguaiacolphthalein is produced. In this compd., therefore, and presumably also in guaiacolphthalein, it is the MeO group which occupies the *p*-position to the central C atom (cf. Hindmarsh, Knight and Robinson, *C. A.* 12, 139) and in dibromoguaiaacolphthalein each Br atom is in the *o*-position to the central C atom and also to one HO group in each nucleus. Quinonoid formulas are suggested for the salts of quinolphthalein. **V. The yellowness of certain phthaleins when acid.** **VI. The ultra-violet spectra of the phthaleins.** *Ibid* 8, 41-4(1919).—The absorption spectra of phenolsulfonephthalein, of benzaurin-*p*-sulfonic acid, and of phenolphthalein mono-Me ether (Green and King, *C. A.* 2, 93) differ from that of benzaurin only in that the absorption band is moved slightly towards the red owing to the loading of the mol. with the sulfonic and carbomethoxy groups, resp. Further, since all three compds. are yellow in slightly acid soln. while phenolphthalein is colorless under these conditions, it is concluded that phenolsulfonephthalein is not a phthalein but benzaurin-*o*-sulfonic acid. Consideration of wave length measurements by Howe and Gibson (*C. A.* 12, 650) of the ultraviolet absorption bands from alk. solns. of phenolphthalein and its derivs. leads to a modification of the earlier formula (*C. A.* 11, 3274) to $y = x - 7$, indicating that in all phthaleins change of the grouping $\text{:C} \begin{smallmatrix} \text{O} \\ \diagup \text{O} \end{smallmatrix}$ to $\text{:C} \begin{smallmatrix} \text{OH} \\ \diagup \text{SO}_3\text{H} \end{smallmatrix}$ is accompanied by a diminution in frequency of 7 units. **VII. Spectra of solid compounds of cobalt, nickel, manganese, and uranium.** *Ibid* 45-9.—Evidence is adduced to show that the effect on the absorption spectrum of loading the mol. either internally by substitution or by combination with a non-ionizing solvent noted in the case of certain org. compds. may also be observed among Co, Ni, and UO_2 salts and among permanganates. It is noted that the wave lengths of homologous lines of Co compds., of UO_2 compds., and of the phthaleins are resp. proportional to the eighth, sixth, and fourth roots of the mol. wts. of the compds. compared. **VIII. Fluorescence and its laws.** *Ibid* 51-3.—The emission

spectra of the green fluorescences exhibited by UO_2 compds. in the solid condition or in non-aq. soln. have been examd. The bands are equally spaced and probably always five in number, but usually some are too faint to be observed. It is found that for all of them

$\frac{A_n}{A_l} = \left(\frac{F_n}{F_l} \right)$, in which A_n and F_n are corresponding wave lengths in the absorption and fluorescent spectra, and A and F are the resp. wave lengths of the lowest bands in each. The relation also appears to hold for some org. compds. which give much the same value, 1.15, for the ratio $\frac{A_n}{A_l}$.

IX. An empirical law of change of color. *Ibid* 1920, 225-8.—An examn. of the absorption spectra of the halide derivs. of phenolphthalein and fluorescein has shown that the effect of the substituents on the position of

the bands is given by the relation $\frac{n}{n_0} = 1 - \left(\frac{m}{100} \right) (1.15 + 0.0037N)$, in which n = the frequency for the halogen deriv., n_0 for that of the parent substance (18.05 for phenolphthalein and 20.27 for fluorescein, m = the number of substituent halogen items, and N = the at. number of the halogen. The relationship also appears to hold approx. for alkyl derivs. The view previously advanced that mol. vol. is the main factor in color change is abandoned in view of the fact that the introduction of Me, iso-Pr, Cl, Br, and I into the mol. produces about the same effect in each case. X. A general numerical solution of the color-constitution problem. *Ibid* 303-11.—It is suggested that the influence of various substituents on the wave lengths of absorption bands of dyes of the Ph_3CH series is represented by definite factors, which are derived as follows. That for $p\text{-OH}$, *e. g.*, is obtained from the ratio $\lambda_{\text{aurin}}/\lambda_{\text{benzaurin}} = 0.9657$. Similarly, values (in parenthesis) are derived for $p\text{-NH}_2$ (0.972), $N\text{-Me}$ (1.0245) [giving NHMe (0.9965) and NMe_2 (1.021)], $N\text{-Et}$ (1.023); for the phthaleins, $o\text{-CO}_2\text{H}$ (1.002), $o\text{-Me}$, -Et , C_6H_5 , -Cl , -Br , -I (1.013 = 0.001), $\gamma\text{-OMe}$ (0.973), $o\text{-OH}$ (1.030), $o\text{-OMe}$ (1.037), $\alpha\text{-SO}_3\text{H}$ (1.018). Values of a more tentative character, owing to lack of data for purposes of control, are also given for $\alpha\text{-Br}$ (1.027), $\beta\text{-Br}$ (1.022), $\gamma\text{-Br}$ (0.975), $\beta\text{-CO}_2\text{H}$ (1.012), $\gamma\text{-CO}_2\text{H}$ (0.995), $\beta\text{-SO}_3\text{H}$ (1.01), $\gamma\text{-SO}_3\text{H}$ (1.027), $\epsilon\text{-SO}_3\text{H}$ (1.010), $\alpha\text{-NH}_2$ (1.022), $C\text{-Ph}$ (1.026). The color factor for 4 Me groups appears also to apply to the thiophenazine dyes, since $\lambda_{\text{methylene-blue}}/\lambda_{\text{thionine}} = \lambda_{\text{malachite-green}}/\lambda_{\text{Dachauer's-violet}}$. The factor for replacement of -CH: by -N: (triphenyl methane \rightarrow indamine series) is about 1.20.

J. C. S.

Reaction of alkali halides with mercury derivatives of phenol. F. C. WHITMORE and EDMUND BURRUS MIDDLETON. *J. Am. Chem. Soc.* 43, 619-24 (1921); cf. *C. A.* 14, 737.

—A number of cases are reported in the literature in which Hg attached to C is replaced by H under the influence of iodide solns. Since there is undoubtedly some relation between the therapeutic value of Hg carbon compds. and the stability of the C-Hg linkage it seemed desirable to study the conditions under which this linkage is broken by inorg. halides. From 12 g. PhOH on the H_2O bath slowly treated with 25 g. $\text{Hg}(\text{OAc})_2$ (about 85% pure) and, when all the salt had dissolved, boiled a few min. with H_2O and treated with a hot soln. of 5 g. NaCl , there were obtained 7 g. o - and 18 g. $p\text{-HOC}_6\text{H}_4\text{HgCl}$; at 125° the yields were 8 and 16 g.; at 150° , 8 and 14 g., resp. When either of these is boiled with aq. KI it dissolves and the soln. becomes alk.; after 30 min. boiling titration with phenolphthalein shows that almost 1 mol. of alkali has been set free; in the case of $2,4\text{-(AcOHg)}_2\text{C}_6\text{H}_3\text{OH}$, almost 2. The reaction is represented by the equation $\text{HOC}_6\text{H}_4\text{HgCl} + 4\text{KI} + \text{H}_2\text{O} = \text{HOPh} + \text{K}_2\text{HgI}_4 + \text{KOH} + \text{KCl}$. With KBr instead of KI , only a little alkali is formed; with KCl , none even on long boiling. When the acetates of the two $\text{HOC}_6\text{H}_4\text{HgCl}$ are boiled with KI the solns. remain neutral and no free PhOH is formed. The o -compd. gives the corresponding $\text{AcOC}_6\text{H}_4\text{HgI}$ (the p -compd. only on long boiling) and a little (about 20%) ($o\text{-AcOC}_6\text{H}_4$) $_2\text{Hg}$. With $\text{Na}_2\text{S}_2\text{O}_8$, the acetates give $(\text{AcOC}_6\text{H}_4)_2\text{Hg}$. (80% in the case

of the *o*-, 50% in that of the *p*-compd.), according to the equation $2\text{AcOC}_6\text{H}_4\text{HgCl} + 2\text{Na}_2\text{S}_2\text{O}_3 = (\text{AcOC}_6\text{H}_4)_2\text{Hg} + \text{Na}_2\text{Hg}(\text{S}_2\text{O}_3)_2 + 2\text{NaCl}$. Boiled with aq. HgCl_2 , the $(\text{AcOC}_6\text{H}_4)_2\text{Hg}$ yield the original $\text{AcOC}_6\text{H}_4\text{HgCl}$. When boiled with 5% NaOH the acetates are converted into NaOAc , PhONa and $\text{NaOC}_6\text{H}_4\text{HgOH}$, the last being pptd. by AcOH as $(\text{HOC}_6\text{H}_4\text{Hg})_2\text{O}$. The acetates suspended in H_2O and treated 15 min. with H_2S give no HgS ; with $(\text{NH}_4)_2\text{S}$ they begin to blacken in about 0.5 hr.; the free mercury phenols react somewhat more rapidly; the $(\text{AcOC}_6\text{H}_4)_2\text{Hg}$ do not react with $(\text{NH}_4)_2\text{S}$ in less than 3 days. The acetates in concd. HCl do not react with H_2S until they have stood about 0.5 hr. (about 1 hr. in the case of the $(\text{AcOC}_6\text{H}_4)_2\text{Hg}$) or have been heated.

C. A. R.

Derivatives of *p*-nitrobenzaldehyde. ALEXANDER LOWY AND CHARLES G. KING. *J. Am. Chem. Soc.* **43**, 625-7(1921).—The following *p*-nitrobenzal compounds were obtained by heating 1 mol. each of $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ and the amine on the H_2O bath. Below are given the m. p., the solvent in which the condensation was effected, the length of heating in hrs. and the % yield, resp. *o*-Phenetidine, yellow plates, 81° , alc., 3 hrs., 90%; *p*-bromoaniline, yellow needles, 160.5° , alc., 2 hrs., 92%; *o*-toluidine, yellow plates, 89° , alc., 2 hrs., 94%; *p*-toluidine, yellow needles, 122.5° , alc., 1 hr., 95%; *1,3,4*-xylydine, yellow needles, 88.5° , AcOH , 1 hr., 85%; *3*-nitro-*q*-toluidine, yellow needles, 161.5° , AcOH , 20 min., 70%; *p*-nitroaniline, yellow needles, 198.5° , AcOH , 0.5 hr., 95%; *m*-nitroaniline, yellow needles, 152° , alc., 2 hrs., 90%. These compds. seem to be stable towards sunlight.

C. A. R.

Dimethyl tartronate. HARRY LINN FISHER AND HAROLD LESTER SIMONS. *J. Am. Chem. Soc.* **43**, 628-9(1921).—The yield of tartronic acid by Osten's method (*Ann.* **343**, 154(1905)) is almost tripled if the reaction mixt. is allowed to stand 21 days instead of 14 as recommended. The dimethyl ester, crystals from MeOH , m. $53.3\text{--}3.5^\circ$, is obtained in 50% yield from the dry Ag salt slowly added to slightly more than 2 mols. MeI and MeOH or C_6H_6 and refluxed several hrs. It is extremely volatile, which shows why it cannot be obtained by esterification by the dry HCl method.

C. A. ROUILLER

Identification of acids. VI. Separation of acids by means of phenacyl esters. J. B. RATHER AND E. EMMET REID. *J. Am. Chem. Soc.* **43**, 629-36(1921); cf. *C. A.* **14**, 1832.—By using binary mixts. instead of individual acids but otherwise proceeding as before in the identification of acids by means of BzCH_2Br , this compd. has been found to be a valuable reagent for the sepn. and identification of the acids. Of 30 mixts. examd., both esters were sepd. pure in 11 cases and 1 component in 17 other cases. Especially good results were obtained with polybasic aliphatic acids in mixts. such as occur in fruits and other natural products. The following acids have been sepd. and identified: citric in the presence of succinic, tartaric, malic, benzoic, oxalic and acetic; succinic in the presence of tartaric, malic, citric, oxalic and acetic; malic in the presence of tartaric, succinic, citric, oxalic and acetic; tartaric in the presence of succinic, malic, citric, benzoic, oxalic and acetic; stearic in the presence of palmitic, oleic and butyric; palmitic in the presence of stearic, oleic and butyric; benzoic in the presence of salicylic, acetic, tartaric, citric, oxalic and succinic; fumaric in the presence of maleic and succinic; cinnamic in the presence of benzoic. The quantitative data for the various sepn. are given.

CHAS. A. ROUILLER

A sulfide alcohol, or butylmercaptoethyl alcohol. T. C. WHITNER, JR. AND E. EMMET REID. *J. Am. Chem. Soc.* **43**, 636-8(1921); cf. *C. A.* **15**, 674.—*Butylmercaptoethyl alcohol*, $\text{BuSCH}_2\text{CH}_2\text{OH}$ (108 g. from 40 g. NaOH and 90 g. BuSH in 250 cc. H_2O refluxed 1 hr. with 80 g. $\text{ClCH}_2\text{CH}_2\text{OH}$), b_p $92\text{--}3^\circ$, d_4^{20} 0.9828, d_4^{25} 0.9693, n_D^{20} 1.4800. Allowed to stand some hrs. with an equal wt. of AcCl it gives the acetate, b_p 84° , d_4^{20} 1.0043, d_4^{25} 0.9875, n_D^{20} 1.4648. Chloride, from the alc. refluxed 4 hrs. with concd. HCl , b_p 68° , d_4^{20} 1.0335, d_4^{25} 1.0101, n_D^{20} 1.4825. Bromide (A), obtained in highest yield (51% β) from 90 g. of the alc. and 125 g. const. boiling HBr refluxed 3 hrs., b_p 74° ,

d_4^{20} 1.2308, d_{25}^{25} 1.2089, n_D^{20} 1.6740. *Dibutyl ethylene sulfide*, $(CH_2SBU)_2$, from 5 g. Na in 100 cc. alc., 20 g. BuSH and 40 g. of A refluxed for a time, b_1 130°. When 35 g. of A is heated 30 min. with 6 g. Na in 75 cc. alc., the oil sepg. on addition of H_2O begins to b. 150° but the b. p. rises steadily to 217°; that *vinyl butyl sulfide*, $BuSCH:CH_2$, is present, however, seems to be indicated by the fact that Br in $CHCl_3$ is quickly absorbed and with HBr is formed a bromide differing in sp. gr. (d_4^{20} 1.2253, d_{25}^{25} 1.2075) from A; that, however, it contains some A, possibly mixed with the isomer $BuSCHBrMe$, is shown by treating it with BuSNa, and oxidizing the resulting bis-sulfide, b_1 106–7°; this gives $BuSO_2CH_2CH_2CH_2SO_2Bu$, m. 180°. Attempts to prep. an iodide by allowing 15 g. of the above chloride, 20 g. NaI and 80 cc. alc. to stand overnight and adding H_2O gave an oil with 41.89% I (calcd. for $BuSCH_2CH_2I$, 52.02) which on attempted distn. *in vacuo* decompd. with liberation of I. The viscous oily residue, after washing with $Na_2S_2O_3$, contained 76.33% I.

CHAS. A. ROUILLER

Some derivatives of butyl mercaptan and their mercuric iodide compounds. T. C. WHITNER JR. AND E. EMMET REID. *J. Am. Chem. Soc.* 43, 638–42 (1921).—The following compds. were prepd. from BuSH in 3–5 parts 95% alc. and an equiv. of NaOH heated with the calcd. amt. of the proper halide; the yields were all fairly good. (The consts. following the b. p. are d_4^{20} , d_{25}^{25} and n_D^{20} resp.) *Butyl ethyl sulfide*, b_1 144–5°, 0.8763, 0.8574, 1.6527; *methylene dibutyl sulfide*, b_1 146°, 0.9482, 0.9332, 1.4864; *ethylene dibutyl sulfide*, b_1 129–30°, 0.9524, 0.9389, 1.4962; *ethoxymethyl butyl sulfide*, b_1 179–81°, 0.9054, 0.8877, 1.4502; *butyl phenacyl sulfide*, b_1 140°, 1.0712, 1.0589, 1.5050. The compds. below were prepd. by heating an aldehyde or ketone with 2 mols. BuSH in a slow current of HCl several hrs. at 50–60° under a reflux: *acetaldehyde dibutyl mercaptal*, b_1 105°, 0.9399, 0.9272, 1.4900; *acetone dibutyl mercaptol*, b_1 110°, 0.9304, 0.9215, 1.4842; *benzaldehyde dibutyl mercaptal*, b_1 167°, 1.0180, 0.9999, 1.4445; *acetophenone dibutyl mercaptale*, b_1 167–8°, 1.0241, 1.0110, 1.5535. *Dibutylsulfonemethane*, m. 182°, is obtained in about 2-g. yield from 4 g. $CH_2(SBU)_2$ boiled 45 min. with 16 cc. H_2SO_4 and 25 g. $Na_2Cr_2O_7$ in 150 cc. H_2O or from 5 g. of the sulfide and 30 cc. fuming HNO_3 . *Ethylene dibutyl disulfone* (25 g. from 10 cc. of the sulfide added slowly to 20 cc. fuming HNO_3), m. 180°. *Ethylidene dibutyl disulfone*, from the sulfide in 2% H_2SO_4 with 5% $KMnO_4$, needles, m. 64°. *Benzylidene dibutyl disulfone* (0.4 g. from 3 g. of the sulfide in 60 cc. AcOH treated with H_2O to incipient turbidity and then with powdered $KMnO_4$), m. 86°. With HgI_2 in Me_2CO , these sulfides give the following compounds: $2EtSBU \cdot 3HgI_2$, plates, m. 163°; $CH_3(SBU)_2 \cdot HgI_2$, m. 89°; $(CH_2SBU)_2 \cdot HgI_2$, plates, m. 85°; $EtOCH(SBU)(HgI)_2$, yellow plates, m. 156°; $BzCH_2SBU(HgI)_2$, yellow plates, m. 158°; $MeCl(SBU)_2(HgI)_4$, yellow plates, m. 138°; $(CH_2I)_2C(SBU)_2(HgI)_4$, yellow plates, m. 159°; $PhCl(SBU)_2(HgI)_4$, yellow plates, m. 86°; $Ph(CH_2I) \cdot C(SBU)_2(HgI)_4$, yellow plates, m. 155°. With Phillips (*J. Am. Chem. Soc.* 23, 256 (1901)), the S in these compds. is assumed to be quadrivalent, $BuS(HgI)_2CMeIS(HgI)_2$.

CHAS. A. ROUILLER

Examination of neoarsphenamine. A. DOUGLAS MACALLUM. *J. Am. Chem. Soc.* 43, 643–5 (1921).—Neoarsphenamine (A) is said to have the structure 4,3-HO(H_2N)C $_6$ H $_4$ As:AsC $_6$ H $_4$ (OH)NHCH $_2$ OSONa and is made by the action of HOCH $_2$ OSONa on arsphenamine (B) (Ger. pat. 245,756). Mol. compds. may be formed, the reaction, unlike that of HOCH $_2$ OSO $_2$ Na, taking place in the presence of either acids or alkalis and the degree of substitution depending on which condition occurs and on such factors as temp., time, concn., and proportion of the reacting substances. The primary products are A and the N,N' -disulfoxylate deriv. of B, and where the technic is not good there are produced mixts. of one or both and of decompn. products. For the recognition of an amorphous product like A it is not sufficient that the powder should have a definite As:S ratio and be sol. in neutral soln., since it may be shown that preps. nearly always contain mechanically mixed free S salts and in some cases consist to a great extent

of reaction by-products. Attempts to distinguish A by the physical properties of the free acid led to nothing definite; the m. p., though distinct, is not very const. nor much removed from those of other arseno compds. Estimation of the As:S ratio gives better but not uniform results. A method was finally devised, however, to distinguish A from more immediate S and non-S by-products; it depends on the portion-wise oxidation of solns. of A by I and, although having certain limitations, gives consistent analytical figures and is effective with relatively small samples of the drug. The error is about 2% and lies largely in the As detn. The method is applicable to the toxicological study of the progressive decompn. of solns. of A. The reaction is represented by the equation $\text{HO}(\text{H}_2\text{N})\text{C}_6\text{H}_4\text{As}:\text{AsC}_6\text{H}_4(\text{OH})\text{NHCH}_2\text{OSO}_3\text{H} + 9\text{H}_2\text{O} + 12\text{I} = 2\text{HO}(\text{H}_2\text{N})\text{C}_6\text{H}_4\text{AsO}_2\text{H}_2 + \text{HCHO} + \text{H}_2\text{SO}_4 + 12\text{HI}$. The total reducing power is detd. by acidifying the soln. with HCl, immediately adding an excess of standard I and titrating back with $\text{Na}_2\text{S}_2\text{O}_3$; the free reducing substances by acidifying with HCl in a CO_2 or N atm., shaking thoroughly, filtering, adding excess of I to the filtrate and titrating with $\text{Na}_2\text{S}_2\text{O}_3$; the As, after oxidation, by the method of Lehmann (cf. Fargher, *C. A.* 14, 273) or Rogers (*C. A.* 14, 389). The amt. of I required by the As + the free reducing substances subtracted from that required by the total reducing substances gives the amt. of combined sulfoxylate. Analyses of the best preps. of A indicate that it is not possible to make products with a sulfoxylate : As ratio exactly equal to 1 : 2 but products closely approximating this are quite practicable. C. A. R.

The reaction between acid halides and aldehydes. II. H. E. FRENCH with ROGER ADAMS. *J. Am. Chem. Soc.* 43, 651-9(1921); cf. *C. A.* 13, 132.—The reaction between aromatic acid halides and aromatic aldehydes, resulting in the formation of halogenated benzyl benzoates (A) has been found to be general. Halogen and NO_2 groups in either aromatic nucleus tend to retard the speed of reaction and usually produce more stable substances. Me and MeO groups tend to accelerate the reaction, with the formation of less stable products. The A form stable addition products with $\text{C}_6\text{H}_5\text{N}$ and tert. aliphatic amines; these same products are formed by allowing the acid halide to react with $\text{C}_6\text{H}_5\text{N}$ and then adding the aldehyde. The A react with primary and sec. aliphatic amines to give substituted benzamides, BzH and the amine-HBr salts; with primary aromatic amines are obtained the HBr salts of benzylidene or substituted benzylideneanilines and the org. acid.; sec. and tert. aromatic amines give complex compds. of the Ph_3CH series. With Zn or Cu the A give esters of hydrobenzoin or substituted hydrobenzoins. To prep. the A equimol. amts. of the acid halide and aldehyde were allowed to stand at room temp. in tightly stoppered flasks until there was no further change, washed with a little dry Et_2O or petr. ether, powdered and crystd. Below are given, resp., the max. time in hrs. (unless otherwise stated) required after which there was no further change (addition of a little anhydrous ZnCl_2 greatly lessens this time), the solvent used for crystn. and the m. p. of the product: Phenylbromomethyl *m*-nitrobenzoate, from *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{COBr}$ and BzH, 15, ligroin, 94-6°; *p*-isomer 30 min., ligroin, 139-40°; *o*-bromophenylbromomethyl *p*-nitrobenzoate, from *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{COBr}$ and *o*- $\text{BrC}_6\text{H}_4\text{CHO}$, 15, petr. ether, 140-2°; *p*-bromo isomer, 5 min., ligroin, 146°; phenylbromomethyl 3,5-dinitrobenzoate, 1, ligroin, 126-7°; *p*-bromophenylbromomethyl compound, 2, ligroin, 151-2°; *o*-isomer, 100, ligroin, 119-22°; phenylbromomethyl *o*-chlorobenzoate, 70, petr. ether, 62-3°; *p*-isomer, 3, ligroin, 110-1°; *o*-bromo analog, 15, ligroin, 80°; *p*-bromophenylbromomethyl *o*-bromobenzoate, 40 min., ligroin, 102-3°; phenylbromomethyl *p*-bromobenzoate, 15, ligroin, 119-21°; *o*-bromophenylbromomethyl *p*-bromobenzoate, 5, ligroin, 154-6°; *p*-isomer, 1, ligroin, 120-1°; phenylbromomethyl *p*-iodobenzoate, 4, ligroin, 123-4°; *p*-bromophenylchloromethyl benzoate, from BzCl and *p*- $\text{BrC}_6\text{H}_4\text{CHO}$, 100, ligroin, 109-10°; phenylchloromethyl 3,5-dinitrobenzoate, 50, AcOEt, 135-6°; *p*-bromophenylchloromethyl compound, 200, ligroin, 145-6°; *p*-bromophenylchloromethyl *p*-bromobenzoate, 24, ligroin, 124-5°; phe-

nylchloromethyl cinnamate, 72, ligroin, 80°; *p*-bromophenylchloromethyl cinnamate, 3, ligroin, 92-3°. The following compds. are solid but decompd. so readily that, under ordinary conditions, they could not be purified for analysis: *β*-Phenylvinylbromomethyl *m*-nitrobenzoate, from *m*-O₂NC₆H₄COBr and PhCH:CHCHO; *p*-methoxyphenylbromomethyl *p*-nitrobenzoate; phenylbromomethyl *m*-chlorobenzoate; *p*-methoxyphenylbromomethyl *p*-bromobenzoate; phenylbromomethyl *p*-methoxybenzoate; phenylbromomethyl *o*-methylbenzoate; *m*-isomer. BzCl and BzH in the presence of a little fused ZnCl₂ react at once with evolution of heat but no solid is formed even on long standing and chilling; fractionation of the product under 15 mm. gives BzH, BzCl and BzO. The products from PhCH:CHCOCl with *p*-MeOC₆H₄CHO, piperonal and methylvanillin, although solid, were too unstable for purification. The following pyridine addition products were prepd.: Phenylbromomethyl benzoate, C₆H₅N.BrCHPhOBz, ppt. from EtOH-Et₂O, m. 180° (decompn.); chloro analog, m. 192° (decompn.); *p*-methoxyphenylbromomethyl *p*-nitrobenzoate, m. 126-8°; phenylbromomethyl *o*-methylbenzoate, m. 206° (decompn.). PhCHBrOBz (B) in Et₂O with dry MeNH₂ gives MeNH₂.HBr, PhCH:NMe and BzNHMe; with NH₂Et, BzH and BzNEt₃; with NMe₃, the trimethylamine addition product, C₁₇H₁₈O₄NBr, crystals from alc., m. 136-7°; with *o*-ClC₆H₄NH₂, the yellow phenylbromomethyl-*o*-chloroaniline; with *p*-ClC₆H₄NH₂, the *p*-isomer; with *p*-MeC₆H₄NH₂, phenylbromomethyl-*p*-toluidine; with PhNH₂, BzOH, BzH and a dark red viscous mass sol. in alc. with red in direct and green in reflected light, forming a green soln. when oxidized with PbO₂ and HCl and giving in alc. with HgCl₂ a white ppt. which turned blue on drying; with PhNH₂, a green gummy deposit giving with Meldola's method crystals of the dye from (PhNHC₆H₄)₂CPhOH; with PhNMe₃, a green viscous mass reduced by Zn and HCl to the leuco base of malachite green. With Zn dust in Et₂O, B yielded 20% [PhCH(OBz)]₂; *p*-BrC₆H₄CHBrOBz gave 16.8% dibenzoyl-*p*,*p'*-dibromohydrobenzoin, crystals from C₆H₆, m. 225°. B reacted with Cu powder as with Zn dust; Na, Mg and Al powders gave negative results. The reaction between B and KOH and KCN resulted in complete hydrolysis under the most varied conditions. III. L. H. ULLICH with ROGER ADAMS. *Ibid* 660-7.—As with the aromatic acid halides and aldehydes, so the reaction between aliphatic aldehydes and aliphatic or aromatic acid halides to form halogenated esters is general. The stability towards H₂O of the addition products decreases in the order aromatic halide-aliphatic aldehyde, aromatic halide-aromatic aldehyde, aliphatic halide-aliphatic aldehyde. The first are formed in 40-60, the third in 50-70% yields. The reactions of the products with NH₃, certain amines, C₆H₅N, quinoline, KOH and H₂O resemble those of the purely aromatic compds. The purely aliphatic compds. are prepd. by heating equimol. amts. of the components and a little ZnCl₂, 3-4 hrs, at 90°; the aromatic halide-aliphatic aldehyde compds. by slowly treating the heated halide with 1 mol. of the aldehyde and gently refluxing 0.5-1.0 hr. The following compds. were prepd.: Chloromethyl esters: acetate (A), *b*₇₁₈ 113-5°; propionate, *b*₇₁₀ 128-30°; butyrate, *b*₇₁₈ 148-9°; valerate, *b*₇₁₀ 163-6°; chloroacetate, *b*₇₄₈ 130-2°; benzoate (B), *b*₁₁₈ 114-5°; *p*-chlorobenzoate, *b*₁₂₀ 163-5°. *α*-Chloroethyl esters: acetate (C), *b*₇₁₀ 113-6°; propionate, *b*₇₁₀ 133-5°; butyrate, *b*₇₁₀ 150-3°; valerate, *b*₇₁₀ 163-5°; benzoate (D) *b*₁₁₈ 120°. *α*-Chlorobutyl benzoate, *b*₁₁₈ 135-8°. *α*-Chloroisobutyl acetate, *b*₁₁₀ 78-81°; propionate, *b*₁₁₈ 67-70°; butyrate, *b*₁₁₀ 74-6°; valerate, *b*₁₁₀ 80-3°. *α*-Chloroisovaleryl acetate, *b*₁₁₀ 89-92°; benzoate (E), *b*₁₁₈ 145-7°. *α*-Chloroheptyl acetate (F), *b*₁₁₈ 120-2°; butyrate, *b*₁₁₈ 120-2°; benzoate (G), *b*₁₁₈ 180-3°. Bromomethyl acetate, *b*₇₁₀ 130-3°; benzoate, *b*₁₁₈ 135-7°. *α*-Bromoethyl acetate, *b*₇₁₈ 122-5°; bromoacetate, *b*₁₁₈ 95-7°. *α*-Bromoisobutyl acetate, *b*₁₁₀ 73-5°. *α*-Bromoisovaleryl acetate, *b*₁₁₈ 85-8°. *α*-Bromoheptyl acetate, *b*₁₁₈ 113-6°. In the reaction between aromatic acid halides and aliphatic aldehydes, aromatic acids and alkylidene dibenzoate or substituted dibenzoates are always formed as by-products; the amt. of acid formed is practically nil in the case

of paraformaldehyde and small with paraldehyde, but is considerable with butyral- and heptaldehydes, decreasing slightly with increase in mol. wt. of the aldehyde. A possible explanation of the formation of the acid is that aldol condensation takes place: $2\text{AcH} + \text{BzCl} \longrightarrow \text{MeCH}(\text{OBz})\text{CH}_2\text{CHO} + \text{HCl} \longrightarrow \text{MeCH}:\text{CHCHO} + \text{BzOH}$. To be sure, no unsatd. aldehyde was isolated in any case, but this is not surprising as such a compd. would undoubtedly condense further with BzCl. A with NH_3 in Et_2O gives chiefly AcNH_2 , NH_4Cl and HCHO and with primary and sec. aliphatic amines the corresponding amine derivs.: 20 g. A with 25 g. PhNH_2 in Et_2O yields 20 g. PhNHAc and 15 g. anhydroformaldehyde-aniline. B (20 g.) in 100 cc. Et_2O with NH_3 gives 13 g. BzNH_2 , NH_4Cl and HCHO ; from 15 g. B and 12.8 g. NHEt_2 in Et_2O are obtained 5 g. $\text{NHEt}_2\cdot\text{HCl}$ and 8 g. BzNEt_2 ; from 15 g. B and 16.4 g. PhNH_2 , $\text{PhNH}_2\cdot\text{HCl}$, anhydroformaldehyde-aniline and 10 g. BzNHPh . A and B do not react in 2 weeks with equimol. amts. of PhNEt_2 . B with 1 mol. $\text{C}_6\text{H}_5\text{N}$ forms a stable addition product, crystals from $\text{EtOH}-\text{Et}_2\text{O}$, m. $177-8^\circ$. A forms a similar but less stable addition product. D, E, F, and G do not react with $\text{C}_6\text{H}_5\text{N}$. A with quinoline gives the addition product $\text{C}_9\text{H}_{12}\text{O}_2\text{NCl}$, m. $214-6^\circ$ (decompn.). A and C in H_2O slowly decomp. in 24 hrs. into AcOH , HCl and the corresponding aldehyde while B and D show no signs of decompn. in 2 weeks. A number of the above esters were treated with powdered KOH ; in every case there were formed the K salt of the org. acid, KCl and the aldehyde.

CHAS. A. ROUILLER

Action of sulfuric acid on dicyanodiamide. TENNEY L. DAVIS. *J. Am. Chem. Soc.* 43, 669-72 (1921).—As the reaction of concd. H_2SO_4 on dicyanodiamide (A) provides a ready means of prepg. guanidine (B) from an abundant source a study has been made of the conditions which will give the largest yield of B. In the first expts. the A was heated with 4 parts of 61% H_2SO_4 and portions of the reaction mixt. analyzed at intervals for B by pptn. with NH_4 picrate (Vorzarik, *Z. angew. Chem.* 15, 670 (1902)), but the ppt. is contaminated with varying amts. of guanylurea picrate and the results are very erratic. Attempts to det. the NH_3 failed as the alkali used to liberate the NH_3 attacked the reaction products and gave too high results. Finally the progress of the reaction was followed by detg. the amt. of CO_2 evolved, and the amt. of B was detd. at the end of 6 hrs. by the V. method. At 100° the amt. of B, as detd. by analysis, is greater than corresponds to the CO_2 evolved, indicating that the pptd. picrate is contaminated; at higher temps. the CO_2 exceeds the B, indicating that B itself is destroyed by the strong H_2SO_4 , probably according to the equation $\text{NH}:\text{C}(\text{NH}_2)_2 + 2\text{H}_2\text{O} \longrightarrow \text{CO}_2 + 3\text{NH}_3$. But as both this reaction and that leading to the formation of B ($\text{NH}:\text{C}(\text{NH}_2)\text{NHCN} + \text{H}_2\text{O} \longrightarrow \text{NH}:\text{C}(\text{NH}_2)\text{NHCONH}_2 + \text{H}_2\text{O} \longrightarrow \text{NH}:\text{C}(\text{NH}_2)_2 + \text{CO}_2 + \text{NH}_3$) produce 1 mol. CO_2 the amt. of B actually produced (and in part destroyed) is the arithmetical mean of that found by analysis and that indicated by the CO_2 . Below are the % yields of B, after heating 6 hrs. with 4 parts 61% H_2SO_4 , as actually found and as calcd. from the CO_2 evolved, resp.: 100° , 35.1, 34.8; 120° , 68.3, 71.4; 140° , 84.7, 88.0; 160° , 85.4, 88.9; 200° , 85.9, 89.9. C. A. R.

Butyl- and isobutyl cyanoacetic acids. JOHN C. HESSLER AND WILLIAM F. HENDERSON. *J. Am. Chem. Soc.* 43, 672-6 (1921).—The Conrad-Limpach reaction applied to $\text{NCCH}_2\text{CO}_2\text{Et}$ (A) with iso-BuOH as solvent gives iso-Bu rather than Et esters. Thus, from 6.6 g. Na in 185 cc. iso-BuOH, 32.4 g. A in 65 cc. iso-BuOH and 55 g. iso-BuI are obtained 19.55 g. isobutyl diisobutylcyanoacetate, b_{710} $155-60^\circ$, b_{710} $250-60^\circ$, d_{15} 0.9118, and a little iso-Bu isobutylcyanoacetate, iso'ated as the acid (B) by treatment with 10% aq. NaOH. The diisobutylcyanoacetic acid (C), obtained from the ester by sapon. with KOH in MeOH, seps. from petr. ether in fine needles, from Et_2O -petr. ether in rhombohedrons, m. $85-6^\circ$ (Freyron, *C. A.* 4, 1486, gives $90-1^\circ$). Salts of B: zinc, roses of tiny flat plates with 1 H_2O ; calcium, crust with 2 H_2O ; lead, needles with 3 H_2O ; cadmium, deliquescent crystals with 1 H_2O . Salt of C: barium,

long needles with 1 H₂O; *calcium*, needles with 2 H₂O; *cadmium*, needles with 1 H₂O; *cobalt*, purple crystals with 1 H₂O, becoming bright blue *in vacuo* over H₂SO₄. From 50 g. A in 100 cc. alc., 10.2 g. Na in 350 cc. alc. and a slight excess of BuI is obtained 55.68 g. crude ester, 21.03 g. of which, treated with 10% NaOH, yields 4.89 g. of the di-Bu deriv. (below) and 10.2 g. *butylcyanoacetic acid* (D), slightly colored sirup with a mild odor, does not solidify at 0°; *silver salt*, amorphous ppt.; *barium salt*, crystals with 1 H₂O; *cadmium salt*, non-cryst. solid with 3 H₂O; *ethyl ester*, from the Ag salt and EtI, sirup of faint agreeable odor, *b*₂₅ 129–31°, *b*₇₃₄ 230–3°, *d*₁₅ 0.9576; *butyl ester*, sirup of mild odor, *b*₂₅ 157–61°, *b*₇₃₅ 255–60°, *d*₂₁ 0.9369; *amide*, from the Et ester and concd. NH₄OH, flat leaflets from alc., m. 125°. *Ethyl dibutylcyanoacetate*, obtained by distn. of the NaOH-insol. portion of the crude ester (above), liquid of a faint odor, *b*₂₅ 154–6°, *b*₇₃₅ 255–60°, *d*₂₁ 0.9196, does not solidify at –12°; *free acid*, silky needles from petr. ether, has a mild agreeable odor, m. 60°; *silver salt*, bulky ppt.; *cadmium salt*, short needles; *amide*, through the chloride with NH₄OH, needles from dil. alc., m. 123°.

CHAS. A. ROUILLER

Spiropyrimidines. 1. *Cyclobutane-1,5-spiropyrimidines*. ARTHUR W. DOX AND LESTER YODER. *J. Am. Chem. Soc.* **43**, 677–84 (1921).—D. and Y. recommend that in naming bicyclic compds. containing a C atom common to both rings the two rings with their substituents be named separately in the usual manner and the term *spiro* be inserted between them preceded by numbers locating the position of the central C with respect to each ring in the order named. In the present paper is described the prepn. of a series of derivs. of a spiropyrimidine in which the 2 nuclei are cyclobutane and barbituric acid. Di-Et cyclobutane-1,1-dicarboxylate (A) was condensed by Fischers veronal synthesis method with 3 types of urea derivs.: (1) *N*-substituted ureas in which the substituent is an alkyl, aryl or amino group; (2) *C*-substituted ureas where the substituent is a S or imine group; and (3) amidines. CH₃(CH₂OH)₂ by Kamm and Marvel's method (*C. A.* **14**, 1676) gave 90% or more of CH₃(CH₂Br)₂, from which by a modification of Perkin's method, was obtained 42% of A. The condensations were effected by heating the A, excess of the urea and 3 equivs. of Na in the minimum amt. of abs. alc. 4–6 hrs. at 105–8°. *Cyclobutane-1,5-spiro-2,4-triketohexahydropyrimidine* (*trimethylenobarbituric acid*) (5.7 g. from 10 g. A and 5 g. urea), scales from H₂O, m. 258°, has a bitter taste much like that of veronal. *1-Methyl homolog* (2 g. from 7 g. A and 6 g. MeNHCONH₂.HNO₃), flat plates from H₂O, m. 170°. *1-Ethyl compound* (3 g. from 8 g. A and 4.5 g. EtNHCONH₂), scales, m. 135°. *1-Phenyl compound* (3.5 g. from 10 g. A and 9 g. PhNHCONH₂), hair-like needles from alc., m. 225° is practically tasteless. *1-Benzyl compound* (5 g. from 7.2 g. A and 7 g. PhCH₂NHCONH₂), needle from alc., m. 131°, has a bitter taste. *1-Amino compound* (2 g. from 10 g. A and 8 g. H₂NCONHNH₂.HCl), practically tasteless scales, m. 262° (sudden gas evolution). *Cyclobutane-1,5-spiro-2-imino-4,6-diketohexahydropyrimidine* (7.5 g. from 10 g. A and 7.7 g. guanidine carbonate), is tasteless, amorphous, does not m. 300°, sol. in acids and alkalies, pptd. from alkalies by excess of AcOH. *2-Cymino compound* (2.8 g. from 10 g. A and 6.3 g. dicyanodiamide), slightly bitter flat needles, does not m. 300°. *2-Thio compound* (obtained in small amt. by boiling 3.5 g. Na in 65 cc. alc., 10 g. A and 6.5 g. CS(NH₂)₂ 8 hrs. under a reflux), slightly bitter, pale straw-colored scales, m. about 240°. *Cyclobutane-1,5-spiro-2-phenyl-4,6-diketotetrahydropyrimidine* (4.5 g. from 6.4 g. A and 6 g. PhC(=NH)NH₂.HCl), tasteless, bright yellow microcrystals, m. 263°. *Cyclobutane-1,1-dicarboxamide*, needles, m. 278°, is obtained in 40% yield from A allowed to stand 1 week in concd. NH₄OH with occasional shaking.

CHAS. A. ROUILLER

The diphenylamine reaction. ALBERT B. WEINHAGEN. *J. Am. Chem. Soc.* **43**, 885 (1921).—W.'s experience with the reaction fully substantiates the important influence attributed to the amt. of H₂O present by Harvey (*C. A.* **14**, 2336). CHAS. A. ROUILLER

Intersolubility of β,β' -dichloroethyl sulfide and ethyl alcohol. THOS. G. THOMPSON, J. H. BLACK AND G. T. SOHL. *J. Am. Chem. Soc.* **43**, 877-9(1921).—Tables and curves are given, showing the intersol. of $(\text{ClCH}_2\text{CH}_2)_2\text{S}$ (A) and 92.5% and abs. alc. The critical temp. of soly. of A and abs. alc. is 15.6° , that of A and 92.5% alc. 38.6° . Crude A (71%) was extd. at a temp. slightly above the critical point of soly. with an equal vol. of 92.5% alc.; most of the S and a tar-like mass remained insol. and the supernatant soln. was cooled considerably below the critical temp.; there were formed 2 liquid phases, the upper consisting primarily of A in alc. and the lower of alc. in A; by sufficiently lowering the temp. crystals of solid A were obtained. Yields of 19-31.8% of excellent A were obtained.

CHAS. A. ROULLER

Catalytic preparation of mercaptans. R. L. KRAMER AND E. EMMET REID. *J. Am. Chem. Soc.* **43**, 880-90(1921).—A study has been made of the various factors involved in Sabatier's catalytic method of prepg. mercaptans (*C. A.* **4**, 2935), viz. prepn. of the catalyst, temp., rate of flow, ratio of reacting substances, nature of the alc. and purification of the product. It has been found that by passing the alc. vapor and an equiv. of H_2S at the rate of 1 mole per hr. through a tube containing pumice coated with 12.5 g. thoria at 380° , the following % yields of mercaptan are obtained: Me 41, Et 35, Pr 45, Bu 52, iso-Bu 45, iso-Am 47. Pr, Bu and iso-Am mercaptans give const. boiling mixts. with the corresponding alcs. and ternary mixts. with the alcs. and H_2O . The best catalyst is prepd. by covering 6-12-mesh pumice with cond. aq. The nitrate in such amt. that the ratio pumice:thoria shall be 3:1, evapg. with const. stirring, heating in a current of air at 270° until the decompn. of the nitrate is nearly complete, then gradually heating to 400° and keeping at this temp. until the issuing air no longer reddens moist litmus. The purification of the product varies with the alc. used. MeSH is displaced from its soln. in NaOH by H_2S ; in the case of EtSH and PrSH, the alcs. are washed out of the product with H_2O and the mercaptan is dissolved out of the residue with alkali, pptd. with a mineral acid, washed, dried and fractionated. In the case of the higher alcs., which are difficultly sol. in H_2O , alkali cannot be used for the sepn. as the alcs. dissolve in alk. solns. containing mercaptans, nor can the alcs. be sepd. by distn. as they form mixts. boiling const. at temps. only slightly lower than the mercaptans. Pure BuSH was obtained by pptg. in alc. with $\text{Pb}(\text{OAc})_2$, treating with steam to remove volatile impurities, gradually acidifying, distg. over with steam, sepgg. from the H_2O , drying with Na_2CO_3 and fractionating; so obtained, it b. $70.4-98-8.2^\circ$ and was 99.28-99.39% pure.

CHAS. A. ROULLER

An alkylene and some alkyl halides of 2-[4-hydroxy-3-methoxystyryl] quinoline. LOUIS F. WERNER. *J. Am. Chem. Soc.* **43**, 890-1(1921); cf. *C. A.* **15**, 532.—The following 2-[4-hydroxy-3-methoxystyryl]quinoline derivatives were prepd. by heating the quinoline with an excess of the halide 4 hrs. at $140-55^\circ$ in the dark, removing tarry impurities and unchanged base with hot alc. and washing with cold alc. They are moderately sol. in hot H_2O and alc., slightly in cold alc., practically insol. in other common org. solvents. With the exception of the iso-PrI and iso-BuI compds., all form yellow aq. solns. when acid or neutral and change to fuchsin-red on addition of alkalies. *Ethyl iodide*, brick-red, m. 231° ; *isopropyl iodide*, light tan, m. 266° ; *propyl iodide*, bright vermillion, m. 221° ; *isobutyl iodide*, orange-red, m. $150-5^\circ$; *butyl iodide*, deep orange, m. $155-60^\circ$; *isoamyl iodide*, orange, m. 155° ; *allyl bromide*, bright orange, m. 150° .

CHAS. A. ROULLER

Some derivatives of phenoxarsine. W. LEE LEWIS, C. D. LOWRY AND F. H. BERGEM. *J. Am. Chem. Soc.* **43**, 891-6(1921).—6-Chlorophenoxarsine (A) is obtained in 46% yield by a modification of Pope's method (*Chem. Warfare Comm.*); it is stable to boiling H_2O and 10% NaOH and irritating to the mucous membranes, especially when in soln. in volatile solvents. 6-Iodo compound (27 g. from 25 g. of A in 800 cc. MeOH poured into 23 g. KI in 200 cc. MeOH), bright yellow needles from alc., m. 144° .

6-Bromo compound (17 g. from 25 g. A and 13 g. NaBr in MeOH), dull yellow monoclinic crystals with 1 HBr from alc., m. 128°, obtained in much better yield by refluxing 3 hrs. with excess of concd. HBr **6-phenoxarsine oxide** (B), needle-like fibers from alc., diamond-shaped crystals from C_6H_6 , m. 182°, insol. in alkalies and H_2O which is obtained quant. by adding concd. NH_4OH to 20 g. A in 800 cc. EtOH. **Sulfide** (18 g. from 20 g. A in 700 cc. abs. = alc. treated with H_2S), faintly straw-colored needles from AcOH, m. 161°. **6-Thiocyanophenoxarsine** (15 g. from 20 g. A in 800 cc. alc. and 10 g. KSCN in 80 cc. alc.), bright yellow monoclinic prisms from alc., m. 129°. **Phenoxycacodyl** (6,6-bisphenoxarsine) (4.8 g. from 8 g. B in 150 cc. boiling abs. alc. slowly treated with 9 cc. H_3PO_4 (d. 1.12) and heated 1.5 hrs.), bright yellow needles, m. 159°, insol. in and unaffected by boiling dil. alkalies or HCl, slowly goes over in the air into a mixt. of the oxide and phenoxarsinic acid, m. 219°, which is obtained in 51% yield by a modification of Michaelis' method (Ber. 9, 1566 (1876)) and in 78% yield from A and H_2O_2 in AcOH; **sodium salt** (15.7 g. from 18 g. of the acid in 250 cc. hot alc. and 1.7 g. Na in abs. alc.), hexagonal plates with 3 H_2O from EtOH-Et₂O, does not m. 250°. **6-Ethylphenoxarsine** (18 g. from 2 g. Mg and 8 g. EtI in 50 cc. Et₂O and 23 g. A in 500 cc. Et₂O added very slowly), needles from alc., Et₂O or C_6H_6 , m. 218°; refluxed 6 hrs. with the calcd. amt. of EtI it gives **diethylphenoxarsonium iodide**, needles, does not m. 300°. Attempts to prep. 6-phenylphenoxarsine resulted in the formation of B.

CHAS. A. ROULLIER

Preparation of *p*-diphenylpropionic acid, and new reactions of biphenyl and its derivatives. CHESTER L. KNOWLES. *J. Am. Chem. Soc.* 43, 896-8 (1921).—**Methylbiphenyl**, b. 264°, is obtained in 30% yield from 70 g. solid PhN_2Cl shaken about 1 hr. with 50 g. $AlCl_3$ and 200 cc. $PhMe$ at 75° and refluxed 1 hr.; 5 g. (dried over Na) chlorinated at 210° in the dark until 2 atoms Cl have been absorbed, then heated 4 hrs. at 150° with 10 parts H_2O in sealed tubes after expelling the air with CO_2 , gives ***p*-diphenylaldehyde**, b. 121°; 4 g. of this refluxed 4 hrs. with 2.8 g. KOAc and 24 cc. Ac_2O yields ***p*-diphenylacrylic acid**, fine needles from 60% AcOH, m. 184°, decolorizes $KMnO_4$; 1.5 g. heated 3 hrs. at 100° in a sealed tube with the calcd. amt. of EtOH and H_2SO_4 gives 1.02 g. of the ester which, heated 6 hrs. with 2 atoms Br in CCl_4 , evapd, and heated on a H_2O bath with 0.75 g. KOH yields ***p*-diphenylpropionic acid**, crystals from 60% AcOH, m. 147° (CO_2 evolution), is highly unsatd.

C. A. R.

Synthesis of anthracene from naphthalene. C. W. COLVER with WILLIAM A. NOYES. *J. Am. Chem. Soc.* 43, 898-905 (1921).—It was desired to synthesize anthracene (A) from a deriv. of $C_{16}H_{12}$ in which the actual nucleus of the $C_{14}H_{10}$ mol. was known to remain intact, as such a synthesis would explain satisfactorily the disposition of the 4th valence of the 9- and 10-C atoms of A. The desired object was not quite attained but a deriv. of $C_{16}H_{12}$ was made from which A was obtained by distn. with Zn dust. β - $C_{16}H_{12}SO_2H$ was obtained in 70% yield by a modification of Witt's method (C. A. 9, 2094); the Na salt, distd. under 30-60 mm. with an equal wt. of NaCN, gave 25-50% of the nitrile which, refluxed 6-8 hrs. with 20-30% KOH, yielded 20% of β - $C_{16}H_{12}CO_2H$. This, reduced with 3% Na-Hg, gave about 75% labile Δ^1 - and 25% stable Δ^2 -dihydro- β -naphthoic acid; after removal of the Hg and careful filtration through asbestos the mixt. was converted entirely into the stable Δ^2 -acid by heating 1.5 hrs. on the H_2O bath with a little NaOH; yield of recrystd. Δ^2 -acid, 65%. Refluxed 9 hrs. in alc. satd. with HCl, it gives 85% of the Et ester, greenish yellow oil, b_D 172-3°, d_{20} 1.1155, d_4 1.1126, n_D 1.5735, 1.5691, 1.5665 at 20°, 30° and 35°; 25 g. refluxed 48 hrs. with 2.5 g. Na in 100 g. alc. and 16.5 g. $AcCH_2CO_2Et$ gave a small amt. (0.5 g. from several condensations) of **ethyl 2,4-diketooctahydroanthracene-1-carboxylate**, heavy dark red liquid of a peculiar odor, converted by refluxing 2-3 hrs. with 3 times the amt. of 0.1 N KOH required for neutralization or by heating 8-10 hrs. in sealed tubes with 1:1 HCl and heating the product on the H_2O bath to expel CO_2 into **2,4-diketooctahydroan-**

thracene, semicryst. mass easily sol. in Na_2CO_3 and NaHCO_3 , which on distn. with Zn dust yields A. CHAS. A. ROUILLER

Trimethylphosphine and its selenide. R. R. RENSHAW AND F. K. BELL. *J. Am. Chem. Soc.* **43**, 916-9(1921).— PMe_3 was prepd. essentially by the methods of Hofmann, from PH_4I and MeOH (*Ber.* **4**, 209 (1871)) and from PCl_3 and ZnMe_2 (*Ann.* **104**, 29 (1857)). *Trimethylphosphine selenide*, which was probably obtained by H., who, however, gives 84° as the m. p., is prepd. by allowing PMe_3 in 4-5 vols. Et_2O to stand with a slight excess of pptd. Se in a stoppered bottle with occasional shaking until the pronounced odor of the PMe_3 has disappeared (several hrs.); it seps. in needles, turning slightly pink and finally reddish in the air, m. 140° . CHAS. A. ROUILLER

Addition of aromatic amines to bromonitrostyrene. DAVID F. WORRAL. *J. Am. Chem. Soc.* **43**, 919-25(1921).—The first step in the reaction between org. bases and bromonitrostyrene (A) (which is shown by the results of this investigation to have the structure $\text{PhCH}:\text{CBrNO}_2$) is direct addition and under favorable conditions the addition product can be isolated. Thus, when 20 g. A suspended in 35 cc. alc. at 0° is slowly treated with 9.2 g. *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ in 15 cc. warm alc. crystals begin to sep. in a few min. and after 1 hr. there is obtained 20 g. (evapn. of the mother liquor yields 7 g. more) of α -bromonitro- β -phenyl-*p*-toluidinoethane (B), crystg. from alc. in narrow golden yellow plates, m. $107-8^\circ$ (foaming), easily decompd. into CH_2BrNO_2 by heat, also broken down by acids and bases, easily oxidized and acted upon by halogens and by HNO_3 , so that it is very difficult to obtain it pure. Hot H_2O decomp. it into A, BzH and $\text{MeC}_6\text{H}_4\text{NH}_2$; hot concd. HCl into BzH , CH_2BrNO_2 and $\text{MeC}_6\text{H}_4\text{NH}_2$; HCl in Et_2O gives the *hydrochloride*, voluminous ppt. of feathery needles, m. $102-4^\circ$ (decompn.), very sensitive to moisture, regenerating B and HCl . Allowed to stand several hrs. in a small vol. of 20% NaOH B changes to a thick paste of microneedles of the *sodium salt*, from a cold soln. of which B is pptd. by excess of dil. AcOH . From 5 g. B in CHCl_3 refluxed 30 min. with excess of Br are obtained 2.8 g. 3,5-dibromo-4-toluidine-HBr and 5.4 g. of an oily mixt. of CH_2BrNO_2 , BzH and A. Concd. HNO_3 gives a *dinitro derivative* (4 g. from 5 g. B), flat pale yellow needles from alc., m. $154-5^\circ$; the NO_2 groups are in the toluidine residue, for heating with NaOH gives BzH . α -Bromonitro- β -phenylhydrazinophenylethane (4 g. from 5 g. A in 20 cc. alc. and 2.4 g. PhNHNH_2 in 10 cc. alc. allowed to stand hr. at 0°), crystals from alc., m. $83-3.5^\circ$ (decompn.), decolorizes KMnO_4 , reacts with Br, forms a salt with HCl , is easily decompd. into $\text{PhNHN}:\text{CHPh}$ and CH_2BrNO_2 . PhNH_2 with A in cold alc. gives CH_2BrNO_2 and BzH ; all attempts to isolate the addition products failed. *o*- and *m*- $\text{MeC}_6\text{H}_4\text{NH}_2$ likewise gave oils containing CH_2BrNO_2 . *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ gives CH_2BrNO_2 and *p*- $\text{C}_6\text{H}_4(\text{N}:\text{CHPh})_2$. $(\text{C}_6\text{H}_5\text{NH}_2)_2$ gives $(\text{C}_6\text{H}_5\text{N}:\text{CHPh})_2$. α - $\text{C}_{10}\text{H}_7\text{NH}_2$ yields a mixt. of BzH , CH_2BrNO_2 and $\text{C}_{10}\text{H}_7\text{NH}_2$; Ph_2NNH_2 forms $\text{Ph}_2\text{NN}:\text{CHPh}$ and CH_2BrNO_2 ; negative results were obtained with Ph_3NH , *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ and PhNMe_2 . Substituted aromatic amines containing negative groups, therefore, do not react with A. The addition compds. as a rule decomp. as fast as they are formed into CH_2BrNO_2 and Schiff bases; the latter are decompd. by the CH_2BrNO_2 into BzH and the amine. CHAS. A. ROUILLER

Application of Victor Meyer's esterification law to 2,6-xylic acid and its reduced derivatives. RALPH W. HUFFERD with WILLIAM A. NOYES. *J. Am. Chem. Soc.* **43**, 925-35(1921).—A comparison of the results obtained in the esterification of 2,6-xylic acid (A) and its reduced products shows that the Victor Meyer esterification law cannot be applied quant., to be sure, but offers strong evidence against Rosanoff's statement that the law is of little practical value (*C. A.* **3**, 533). Below are given resp. the degree of esterification of the various acids as predicted by the law and the % of esterification actually found after boiling 4 hrs. with MeOH containing 4% of $\text{HCl}:\text{BzOH}$, quant., 96; A, none, 3.5; Δ^1 -tetrahydroxylic, (B), fair, 41; Δ^2 -isomer (C), poor to good,

75; $\Delta^1,6$ -dihydroxylic (D), none, 47; hexahydroxylic (E), poor to good, 52%. The materials used in this work were prepd. in general by the methods used before (*Am. Chem. J.* 22, 1(1898)). Mesitylene was obtained in 16–9% yield from Me_3CO ; 255 g. gave 300 g. acetomesitylene, b_{18} 122–2.5°; 90 g. of this yields 70–95% dimethyl-terephthalic acid; this on esterification gives consistently more than 97% of the mono-ester, which is converted by NH_4OH into the monoamide in 75% yield; this is transformed, without isolating any intermediate products, by successive treatment with Br in NaOH , H_2SO_4 , KNO_3 and KI into 4,2,6- $\text{IMe}_2\text{C}_6\text{H}_2\text{CO}_2\text{H}$, which with Zn dust and NH_4OH gives 65% A, b_{17} 155–80°, m. 116°. By reduction of A with Na in iso-AmOH is obtained Δ^1 -tetrahydro-2,6-xylic acid (C), b_{23} 158–60°, m. 93.4°, n_D^{25} 1.4462, d_{20} 0.9553, destroyed by 1:1 H_2SO_4 but unchanged by heating 24 hrs. with 50% KOH. The remaining fractions of the reduction product of A, allowed to stand in satd. HBr, then treated with ice and H_2O and reduced in NaHCO_3 suspension with Na-Hg, gave E, m. 74.5–5.3°, n_D^{25} 1.4371, d_{20} 0.9454. B was prepd. by treating 2 g. E with 3 g. PCl_5 , heating 3 hrs. at 100° in a sealed tube with 0.657 cc. Br, pouring into H_2O , extg. with Et_2O , drying with Na_2SO_4 , aerating off the Et_2O , refluxing 1 hr. with HCO_2H and refluxing the resulting Br acid 10 hrs. with alc. KOH (yield, 2 g. from 6 g. E); it m. 91–1.5°, d_{25} 0.8625, n_D^{25} 1.4700. 1,2-Dibromohexahydro-2,6-xylic acid, from B and Br in CHCl_3 , m. 128–32° (decompu.); heated 0.5 hr. on the H_2O bath with a slight excess of 0.1 N alkali it gives $\Delta^1,6$ -dihydro-2,6-xylic acid, (D), b_{18} 155–80°, becomes of the consistency of vaseline on standing *in vacuo*, dissolves completely in NaHCO_3 , reduces KMnO_4 very rapidly, decolorizes Br in CHCl_3 . The ionization consts. at V 1024 at 25° for A, B, C and E were found to be 58.8, 4.32, 4.17 and 1.31×10^{-5} , resp.

CHAS. A. ROUILLER

The benzilic acid rearrangement. The non-addition of hydrogen peroxide to diphenyl ketene. BEN H. NICOLET AND JOSEPH J. PELC. *J. Am. Chem. Soc.* 43, 935–7 (1921).—Schröter's theory of the mechanism of the benzilic acid rearrangement involves as an intermediate step the addition of H_2O_2 or its K salt to $\text{Ph}_2\text{C}:\text{CO}$ (*C. A.* 3, 2555). N. and P., however, find no evidence of such addition in anhydrous solvents (Et_2O and low-boiling ligroin) after 8 months and even when the conditions existing during the rearrangement are simulated as nearly as possible by dropping the ketene-peroxide mixt. into an excess of hot NaOH there is no addition. S.'s scheme, in the form given by him, at least, is therefore untenable.

CHAS. A. ROUILLER

C_{18} fatty acids. The non-identity of eleostearic acid tetrabromide from tung oil with ordinary linolic acid tetrabromide. BEN H. NICOLET. *J. Am. Chem. Soc.* 43, 938–40 (1921).— α -Eleostearic acid, prepd. by sapon. of tung oil and crystn. from alc., m. 48°; 10 g. treated in low-boiling ligroin with Br gives 9.8 g. of a dibromide, m. 85°, discolors noticeably in 24 hrs. and becomes completely black in a few days. From 20 g. of the acid in 100 g. AcOH at 5–10° treated with 4 equivs. Br is obtained 2 g. of the tetrabromide, m. 115°, apparently identical with Kametaka's product (*J. Chem. Soc.* 83, 1042(1903)), but when mixed with linolic acid tetrabromide (m. 114°) from cottonseed oil, it softens 100° and m. 103°. β -Eleostearic acid brominated in the same manner gives Morrell's tetrabromide, m. 115° (*C. A.* 7, 967), which is identical with the α -tetrabromide, as shown by mixed m. ps. Ethyl α -eleostearate tetrabromide, crystals from alc., m. 50° (the corresponding linolate m. 63°). Since the α -eleostearic and linolic acid tetrabromides are thus shown not to be identical it is no longer necessary to assume that the acids themselves are stereoisomers.

CHAS. A. ROUILLER

Ethers derived from the addition products of the nitroanilines and chloral. ALVIN S. WHEELER AND SAMUEL C. SMITH. *J. Am. Chem. Soc.* 43, 941–5(1921); cf. *C. A.* 14, 181.—On extending the study of the action of alc. KOH, NaOMe and NaOEt on the condensation products of *o*- and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ with CCl_3CHO to *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$, certain difficulties arose. In combining *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ with CCl_3CHO , a new con-

densation product, m. 130°, was discovered in addition to that, m. 212°, which had been previously described. There was at times also obtained a substance m. 90°, which led to the discovery of a class of ethers derived from the addition products of the nitroanilines and chloral. Thus, mol. quantities of chloral and $m\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ mixed together without solvent or in Et_2O yield a gummy sirup, which on long standing or warming gently passes over into $N\text{-}\alpha\text{-hydroxy-}\beta\text{-trichloroethyl-}p\text{-nitroaniline}$, m. 130°, decompd. by strong acids and bases, CHCl_3 being evolved by the latter. If the gummy product, from 5 g. each of chloral and $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$, before being heated, is dissolved in 20 cc. MeOH and heated a short time on the H_2O bath, it gives 9.5 g. of the $\alpha\text{-methoxy compound}$, bright yellow elongated monoclinic prisms from alc., m. 108-9°, decompd. by hot concd. acids and more slowly by hot concd. alkalis. $\alpha\text{-Ethoxy compound}$, bright yellow monoclinic tabular crystals, m. 90° (yield, 79%). $\alpha\text{-Propoxy homolog}$, thick sirup. $\alpha\text{-Butoxy compound}$, yellow monoclinic prisms, m. 70°. $\alpha\text{-Isoamoxy compound}$, orthorhombic tables and monoclinic prisms, m. 90°. $N\text{-}\alpha\text{-Methoxy-}\beta\text{-trichloroethyl-}p\text{-nitroaniline}$ (9.2 g. from 5 cc. chloral in 50 cc. MeOH heated to boiling with 5 g. $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$), yellow monoclinic prisms, m. 146-7°. $\alpha\text{-Ethoxy compound}$ (yield, 77%), yellow monoclinic prisms, m. 138°. No ethers could be obtained with Pr, Bu and iso-Am alcs.

CHAS. A. ROUILLER

Preparation of esters by direct replacement of alkoxy groups. MARIE REMMER and HELEN RUPERT DOWNES. *J. Am. Chem. Soc.* 43, 945-51(1921); cf. *C. A.* 5, 2845. —The fact that Et $\alpha\text{-cyanocinnamylideneacetate}$, which is too unstable to be prepd. by the usual esterification methods, was obtained from the Me ester by direct replacement of the MeO group by EtO, led to the hope that the method might be of general applicability for the prepn. of esters of unstable unsatd. acids. It seemed of interest, therefore, to study the reaction under conditions least apt to bring about isomerization, i. e., low temp., small amt. of catalyst and short time of reaction. Preliminary expts. with BzOMe showed that when it is shaken with excess of EtOH and 0.05 mol. KOEt 1 hr. at room temp. it gives about 95% of BzOEt, and in the subsequent work this procedure was used. With BzOMe, Et, Pr, Bu, iso-Bu, iso-Am and PhCH₂ alcs. gave 72-97% yields of the corresponding esters. Of the sec. alcs., sec-Bu alc. reacted a trifle while iso-PrOH and menthol did not react, nor did tert-BuOH and EtCPh₂OH. There was no reaction between EtOH and KOEt and the Me esters of salicylic, *o*-bromo- and *o*-nitrobenzoic acids. Me and Et *p*-nitro- and *p*-bromobenzoates reacted nearly quant., but Me and Et *p*-hydroxybenzoates only to a small extent. In the case of dibasic acids, (oxalic, malonic, succinic, terephthalic) when special precautions against sapon. are taken, 58-86% yields are obtained; Me and Et phthalates, however, like other *o*-substituted esters, do not appreciably react.

CHAS. A. ROUILLER

Verification of the purity of and quantitative analysis of organic compounds (CORDEBARD) 7. Acetic and butyric acids from marine algae (U. S. pat. 1,371,611) 16. Chlorinated hydrocarbons (Brit. pat. 156,139) 22. Diols; diolefins (Brit. pat. 156,145) 4. Acetaldehyde; acetic acid (Brit. pat. 156,147) 4.

BODFORSS, SVEN: Die Aethylenoxyde. Ihre Darstellung und Eigenschaften. Stuttgart: Ferdinand Enke. 84 pp. M5. For review see *Chem. Weekblad* 18, 73(1921).

GEORGEVICS, G. Die Beziehungen zwischen Farbe und Konstitution bei Farbstoffen. Zürich: Schulthess and Co. 123 pp. M. 60.

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SCHMIDT, JULIUS: Kurzes Lehrbuch der organischen Chemie. II. Ed. revized. Stuttgart: Ferdinand Enke. M. 150. For review see *Chem. Tech. Ztg.* 39, 8(1921).

Fatty acids. SOC. FRANÇAISE DES DISTILLERIES DE L'INDO-CHINE. Brit. 156,755, Jan. 7, 1921. Fatty acids of the palmitic acid series are prepd. by oxidizing butyl alc. and then subjecting the butyric acid produced to simultaneous hydrogenation and polymerization. Butyl alc., along with steam and O- or ozone-containing gases, is passed through a heated app., preferably comprizing a nest of tubes constructed of or containing any known oxidation catalyst, *e. g.* Pt. The butyric acid formed is condensed, purified and concd., and is then forced with H into a heated autoclave constructed of or containing any known hydrogenation catalyst, *e. g.* Pd. The final products, consisting of fatty acids of high m. p., are condensed, filtered and distd. The butyl alc., as well as the H, may be obtained as a by-product in the biol. manuf. of acetone. The reacting materials must be free from impurities. An app. is described in general terms.

Fatty acids. HYK-GULDENWERKE CHEMISCHE FABRIK AKT.-GES. Brit. 156,259, Jan. 4, 1921. Fatty acids are, prior to distn., purified by sepn. of fatty acids of high mol. wt. which decompose during distn. The sepn. may be effected by fractional soln. or fractional pptn. from soln. or by "freezing out." The fatty acid mixt. may be dissolved wholly in alc., chlorinated hydrocarbons or hydrocarbons of high mol. wt. and the fatty acids of high mol. wt. be pptd. by addition of H₂O, chlorinated hydrocarbons containing less chlorine, or hydrocarbons of lower mol. wt., resp.

Acetic acid. H. DREYFUS. Brit. 156,916, Oct. 17, 1919. The Fe₂O₃ employed as a catalyst in the manuf. of HOAc by the oxidation of liquid acetaldehyde is prepd. by pptn. from a ferric salt soln., followed by heating to a temp. between 310 and 500°. Its catalytic activity is stated to be enhanced thereby. NaOAc may be associated with the Fe₂O₃, but only in a quantity not exceeding about double the amt. of Fe₂O₃.

Acetic acid. H. PLAUSON and J. A. VIELLE. Brit. 156,146, Dec. 31, 1920. In the catalytic oxidation of liquid acetaldehyde to HOAc, the formation of peracetic acid is inhibited by using as catalysts salts containing H₂O of crystn., *e. g.* hydrated salts, particularly the acetates, of Ni, Co, Mn, Cr or Cu, alkali and alk. earth hydrated salts, and alums. Salts specifically mentioned are ferrous sulfate, sodium acetate, potassium cobalt sulfate, potassium ferrisulfate, and manganous sulfate. According to the example, O or air is passed into the acetaldehyde containing finely divided FeSO₄·7H₂O, the resulting HOAc sepd. from the salt and then distd. preferably *in vacuo*. The remaining Fe₂(SO₄)₃ can be used afresh after it has been reduced and crystd. The reaction may take place under increased pressure.

Acetaldehyde; acetic acid. H. PLAUSON and J. A. VIELLE. Brit. 156,152, Dec. 31, 1920. Acetaldehyde is produced by hydrating C₂H₂ with steam under pressure and at a fairly high temp. The reaction is facilitated by the presence of small quantities of acids, such as HOAc, H₂SO₄, HNO₃, H₃PO₄, and org. sulfonic acids, acid anhydrides or S acids. Inert gases or vapors may be employed as diluents. A suitable app. is specified. Acetic acid also is obtained.

Formaldehyde; methanol. H. DREYFUS. Brit. 157,047, Aug. 25, 1917. In the production of HCHO or MeOH or mixts. thereof by catalytic hydrogenation of CO or CO₂, the catalyst may be Pt black obtained by reducing chloroplatinates with HCHO and pptg. with alkali, or Ni obtained by pptg. the nitrate with alkali and reducing at temps. below 100°. Or a Ni, Pt, etc., catalyst may be supported on a porous carrier. *E. g.*, pumice is impregnated with a soln. of a Ni or Pt salt, dried and reduced; or Ni nitrate soln. is mixed with a soln. of Na₂SiO₃ or MgSO₄, the mixt. evapd. to dryness, heated, and reduced. The hydrogenation may be effected in Fe cylinders contg. the porous material impregnated with catalyst; the mixt. of CO and H is preferably admitted at the bottom and the products distil off at the top. Or a series of vertical Fe tubes connected at top and bottom to a collector may be used, the ends of the tubes

being provided with perforated plates to ensure proper distribution of the reacting gases. Cf. 108,855 (C. A. 12, 155).

Formaldehyde; methanol. H. PLAUSON and J. A. VIELLE. Brit. 156,148, Dec. 31, 1920. A mixt. of HCHO and MeOH is produced by momentarily heating methane with CO₂. The CO₂ apparently splits up into CO and O, which latter then oxidizes the methane. The process may be carried out in the so-called isoprene lamp or by passing the gas mixt. through a constricted tube which is heated at the constriction. Slow passage of the gas favors the formation of MeOH, and rapid passage the formation of HCHO. The tube may be made of Cu, Ag, Ni, or alloys of these metals with each other, or alloys with Al, Sn, or Zn; or the tube may be of steel or Fe and contain turnings or wire of Cu, Ag, Al, Ni or their alloys. The reacting gases may first be passed through MeOH or EtOH, in which case small quantities of air may be introduced into the gases; or the mixt. may be dild. with an inert gas, such as N, or a neutral hydrocarbon. Gases containing methane, such as natural gas, may be employed; and the pressure may be reduced during the process.

Ethyl alcohol. H. DREYFUS. Brit. 157,048, Aug. 25, 1917. In the production of alc. by catalytic hydrogenation of aldehyde in liquid form, the catalyst may be Pt black obtained by reducing chloroplatinates with HCHO and pptg. with alkali, or Ni obtained by pptg. the nitrate with alkali and reducing at temps. below 100°. In the production of alc. by catalytic hydrogenation of a dehyde vapor, the catalyst (Ni, Pt, etc.) is supported on a porous carrier; e. g., pumice is impregnated with a soln. of Ni or Pt salt, dried, and reduced; or Ni(NO₃)₂ soln. is mixed with a soln. of Na₂SiO₃ or MgSO₄, the mixt. evapd. to dryness, heated, and reduced. The hydrogenation may be effected in Fe cylinders containing the porous material impregnated with catalyst; the mixt. of aldehyde vapor and H is preferably admitted at the bottom and the alc. formed distils off at the top. Or a series of vertical Fe tubes connected at top and bottom to a collector may be used, the ends of the tubes being provided with perforated plates to ensure proper distribution of the reacting gases. Cf. 108,856 (C. A. 12, 154).

Anthraquinone and its derivatives. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,538, Jan. 5, 1921. Anthraquinone and its derivs. are obtained by treating anthracene etc., dissolved or suspended in an anhydrous acid medium, with O or an O-contg. gas in the presence of a water-fixing agent and a small quantity of a nitrite. An additional O carrier or a neutral solvent may be added. The product is free from nitro products and other impurities. Cf. 156,215 (following pat.).

Anthraquinone. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,215, Jan. 3, 1921. Anthraquinone is prepd. by oxidizing anthracene, preferably dissolved or suspended in a liquid medium, by means of O or an O-contg. gas in the presence of an O carrier. Thus, O is passed under pressure into a hot mixt. of anthracene and HOAc containing a little fuming H₂SO₄; or O containing a small % of nitrous gases is introduced into a hot mixture of anthracene and HOAc contg. Co nitrate. Similarly, anthracenesulfonic acids can be oxidized to the corresponding quinone compds.

Anthraquinone and its derivatives. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,540, Jan. 5, 1921. Addition to 156,215, (preceding pat.). In the process described in the principal patent for the manuf. of anthraquinone and its derivs. by oxidation of anthracene etc. (1) the HOAc medium is replaced by another acid, e. g. propionic acid, and (2) a diluent is employed, e. g. H₂O, nitrobenzene, or dichlorobenzene.

Phenols. B. D. STEELES. Brit. 156,269, Feb. 9, 1918. In the production of phenols by fusing the corresponding sulfonates with caustic alkali, the sulfonate is added to the molten alkali in the form of a hot concd. aq. soln.; the production of phenol and β -naphthol is specified.

Oxidation of hydrocarbons, etc. *CHEMISCHE FABRIKEN WORMS AKT.-GES.* Brit. 156,252, Jan. 4, 1921. Aliphatic or aromatic hydrocarbons or their derivs. are oxidized to alcohols, aldehydes, ketones, or carboxylic acids by interaction with O or an O-containing gas at a pressure greater than atm. in the presence of an O carrier. The temp. may be raised; and the hydrocarbons may be oxidized alone, in soln., or in suspension. Suitable O carriers are Pt sponge, V_2O_5 , nitrous vapors, or metallic salts. According to examples: (1) O is led into toluene, containing a little HNO_3 and heated to 80–100°, until a pressure of 14 atms. is reached; the product is a mixt. of benzaldehyde and benzoic acid; (2) a paraffin oil is oxidized to fatty acids by adding a little HNO_3 and heating the mixt. to 500° in the presence of O at an initial pressure of 10 atm. and a trace of V_2O_5 .

Catalytic oxidation of hydrocarbons. A. WOHL. Brit. 156,244, Jan. 4, 1921. Hydrocarbons are oxidized to aldehyde, ketonic, or carboxylic compds. by passing a mixt. of their vapor with O over a catalyst of a non-basic character maintained at a temp. below red heat. Suitable catalysts are vanadic acid, molybdic acid, and salts of uranic or chromic acid, distributed over a support, such as pumice. In this way anthracene is converted into anthraquinone; aromatic hydrocarbons with side-chains give a mixt. of aldehyde and acid; and unsatd. hydrocarbons of high molecular wt. are converted into acids.

Catalytic oxidation of hydrocarbons. A. WOHL. Brit. 156,245, Jan. 4, 1921. Addition to 156,244 (preceding pat.). Catalysts for the oxidation of hydrocarbons in the liquid or vapor state to aldehyde, ketonic, and carboxylic compds. are the metal salts of acids derived from elements capable of more than 1 degree of oxidation, e. g. vanadates, chromates, molybdates, uranates, stannates, and arsenates of Cu, Ag, Pb, Ti, Pt, Ce, Ni, and Co. According to examples, anthracene yields anthraquinone when mixed with air and passed over pumice impregnated with Ag or Cu vanadate, prepd. by adding Ag nitrate or $CuSO_4$, resp. to an alkali vanadate.

Hexamethylenetetramine. H. PLAUSON and J. A. VIELLE. Brit. 156,136, Dec. 31, 1920. $(CH_2)_6N_4$ is prepd. by oxidizing CH_4 with air in the presence of NH_3 . The mixt. of methane, O or air, and NH_3 in combining proportions is passed through a constricted metallic tube, which is heated at the constricted part. After condensation of the products, the gases may again be led through the app. The tube is made of such a metal as Cu, Ag, Ni steel, Fe, or alloys of Fe with Sn, Zn, Al, or Si, or of Fe with a coating of one of these metals. The tube then acts as a catalyst; but contact material in the form of thin wire or sheets of Ag, Cu, Sn, or alloys thereof may be introduced into the tube. The reaction may take place under reduced pressure, and the CH_4 may be replaced by natural gas. By reducing the amt. of NH_3 in the gas mixt. to be treated, the yield is richer in formaldehyde. The $(CH_2)_6N_4$ obtained can be converted into $HCHO$.

Phthaleins. O. IMRAY. Brit. 157,030, May 31, 1920. Phthaleins are manufd. by condensing a phenol with phthalic anhydride in the presence of an anhydrous aromatic sulfonic acid with or without the addition of a metallic chloride such as $ZnCl_2$. According to an example, phenolphthalein is prepd. by heating phenol and phthalic anhydride in the presence of anhydrous toluenesulfonic acid.

Diolefins and their polymerization products. H. PLAUSON and J. A. VIELLE. Brit. 156,116, Dec. 30, 1920. Diolefins are prepd. by heating mol. proportions of an ethylene hydrocarbon and an acetylene hydrocarbon under pressure. The reaction may take place in the presence of a catalyst such as an oxychloride, molybdic acid, or an oxide or hydroxide of alkali or alk. earth metals; inert gases or vapors may also be employed as diluents, e. g. N, CO_2 , benzene or other hydrocarbon. According to examples: 1,3-butadiene results from the treatment of a mixt. of C_2H_2 and C_2H_4 ; a diolefin of the formula C_6H_8 is obtained from allylene and C_2H_4 ; and a diolefin of the formula

C_4H_8 , which appears to be isoprene, is prepd. from C_2H_2 and propylene. *Synthetic rubber* and the like. By gradually raising the pressure, and if desired increasing also the temp. and time of reaction, the diolefins produced in the manner described above can be polymerized forming liquid and solid products. Thus, a mixt. of C_3H_4 and C_4H_8 , or of allylene with C_2H_4 or propylene, is directly transformed into a rubber-like mass without isolation of the intermediate diolefins. The diolefins may also be polymerized by means of Na.

Diolefins and their halogen derivatives. H. PLAUSON and J. A. VIELLE. Brit. 156,122, Dec. 30, 1920. In the production of diolefins by the pyrogenic decompn. of hydrocarbons, such as turpentine, or hydroxy hydrocarbons, such as cyclohexanol, a halogen or a H halide is introduced for the purpose of combining with the diolefins as soon as they are formed. The reaction is facilitated by the presence of a Si alloy, such as ferromanganese, or Cu-Si, a metallic silicate, an alk. earth metal or a metal of the Pt group. After condensation, the crude chlorinated hydrocarbons are purified by distn.; the diolefins can be recovered by removal of the H or H halide and utilized for rubber synthesis. Other starting materials mentioned are limonene, dipentene, isopentane, amylene, cyclopentanols, glycols, diols and pinacols.

Cymene. BRITISH AND FOREIGN CHEMICAL PRODUCERS, LTD. Brit. 156,329, Oct. 6, 1919. Addition to 142,738 (C. A. 14, 2802). *p*-Cymene is prepd. from pine-needle oil fractions boiling at about 160° by chlorination followed by steam-distn. of the product, in the manner described in the principal patent. The yield of cymene is increased by heating the raw material with an inorg. or org. acid or acid salt, removing the reagent, fractionally distg. the product, and using the fraction boiling at 175° for chlorination.

Vinyl compounds, etc. H. PLAUSON and J. A. VIELLE. Brit. 156,121, Dec. 30, 1920. Vinylsulfuric acid and its homologs are prepd. by forcing an C_4H_8 hydrocarbon under pressure into concd. H_2SO_4 cooled to a temp. below 0° , preferably in the presence of a catalyst such as $HgSO_4$. *Alkyl ethers of vinyl alc.* and its homologs result from the interaction of an alc. with these acid sulfates. Numerous examples are given.

Vinyl halides. H. PLAUSON and J. A. VIELLE. Brit. 156,120, Dec. 30, 1920. Vinyl halides are produced by heating CaC_2 with H halides dissolved in H_2O or an org. solvent in the presence of a catalyst, such as Hg, Cu, Zn, Al, or Sn compds.; or by heating CaC_2 with concd. H halides under pressure in the absence of a catalyst. According to the example, vinyl chloride is prepd. by adding CaC_2 to hot concd. HCl containing a little of the Hg salt of ethylenedichlorosulfonic acid, *ethyldene dichloride* and *dichloroacetaldehyde* being formed as by-products. The formation of dichloroacetaldehyde as a by-product of the above reaction is facilitated by the presence of $FeCl_3$.

Vinyl halides and esters and their polymerization products. H. PLAUSON and J. A. VIELLE. Brit. 156,117, Dec. 30, 1920. Vinyl halides are prepd. by heating C_4H_8 hydrocarbons with halogen hydrides or with methyl halides under pressure. An inert gas or liquid may be present, thereby enabling the pressure to be increased. App. is described. Numerous examples are cited. Details are specified also for the production of vinyl esters, *synthetic rubber*, and acyclic hydrocarbons.

11—BIOLOGICAL CHEMISTRY

HATTIE L. HEFT, EDGAR G. MILLER, JR., AND WILLIAM J. GIES

A—GENERAL

FRANK P. UNDERHILL

Chemical and physical behavior of proteins. JACQUES LOEB. *Chem. Met. Eng.* 24, 550-8(1921); cf. C. A. 14, 3982.—The laws of classical chemistry account for both

the chemical and the physical behavior of the proteins, providing the H-ion concn. (which is the chief variable) is given due consideration. Modern concepts of colloid chemistry err in ascribing reactions of colloids in general and of proteins in particular to absorption, alteration in degree of dispersion or hydration, etc., instead of the purely chem. forces of primary valency. To bring an isoelec. protein soln. to a definite p_H , e. g. 3.0 or 2.5—exactly 3 times as many cc. are required of 0.1 N H_2PO_4 as of 0.1 N HCl or 0.1 N HNO_3 , while equal amts. of 0.1 N H_2SO_4 and 0.1 N HCl are required. Corresponding facts exist with hydrates of Ba, Ca, K and Na. With the same concn. of originally isoelec. gelatin and the same H-ion concn., gelatin chloride, nitrate, tartrate, succinate, citrate and phosphate exhibit the same osmotic pressure, viscosity and amt. of swelling, because the anion is univalent. The SO_4 ion in combination with gelatin is bivalent, and, therefore, the viscosity, etc., are lower, for only the valency of an ion and not its nature, influences the physical properties of a protein. The viscosity, etc., of gelatin reach a max. (in a 1% soln. of originally isoelec. gelatin) at about p_H 3.0-3.6. This is explained upon the basis of the Donnan equil. When a gelatin chloride soln. is sepd. from pure water by a collodion membrane, free HCl diffuses into the water, and when equil. is established the concn. of acid in the water exceeds that in the gelatin. Proctor showed the equil. is defined by the equation $x^2 = y(y + z)$, where x = concn. of H and Cl ions in the water, y = concn. of H and Cl ions in the gelatin, and z = the number of Cl ions in combination with the gelatin. Putting this equation in the form $y/x = x/(y + z)$, and assuming that the p. d. is due to the difference in H-ion concn. on opposite sides of the membrane, then from Nernst's logarithmic formula it follows that the p. d. should equal $0.058 \log (x/y)$; that is $0.058 p_H$ gelatin— p_H water). Calcd. and observed values (tabulated) agree well. The curves showing calcd. variation of osmotic pressure with H-ion concn. of 1% gelatin chloride, phosphate, and sulfate agree practically quant. with observation, gelatin sulfate showing not quite half the observed pressure of the others. "In the literature of colloid chemistry SO_4 is called a dehydrating ion which is supposed to diminish the swelling and the osmotic pressure of proteins through a modification of the protein. From our viewpoint the apparent dehydrating effect of SO_4 is merely the consequence of the fact that the valency of the ion with which the protein is in combination modifies the relative distribution of the crystalloidal ions on the two sides of the membrane."

JEROME ALEXANDER

Ester-splitting properties of the peripheral nerves. SATORU UKAI. *Tohoku J. Exptl. Med.* 1, 519-33(1920).—Filtered glycerol water ext. of the nerves, when tested with tributyrin, has an ester-splitting power which is greater in rabbits and chickens than in human beings.

H. V. ATKINSON

Hippomelanins. III. OTTO RIESSER AND PETER RONA. *Z. physiol. Chem.* 109, 16-31(1920).—The protracted action of 3% H_2O_2 oxidizes a large proportion of the C of hippomelanin to CO_2 . Gradual oxidation by H_2O_2 in the presence of NH_3 will yield more characteristic decompn. products.

H. V. ATKINSON

Benzene derivatives of glutin and a protein derivative of gelatin. E. SALKOWSKI. Univ. Berlin. *Z. physiol. Chem.* 109, 32-48(1920).—A protein has been isolated from gelatin. Gelatin allowed to putrefy at 40° in the presence of KH_2PO_4 , $MgSO_4$ or Na_2CO_3 yields 1.3% of phenylpropionic acid, 0.11% of aromatic hydroxy acids, and a small quantity of succinic acid derived from the aspartic acid of the gelatin. The presence of the aromatic hydroxy acids indicates the presence of tyrosine.

H. V. ATKINSON

Preparation of a highly active sucrase. II. OLOF SVANBERG. *Z. physiol. Chem.* 109, 65-98(1920); cf. *C. A.* 14, 2502.—A large vol. of yeast suspension was digested at 25° until the sucrase increased 5 times. The sucrase was then pptd. with alc. and treated with kaolin. The sucrase was sepd. from the kaolin by H_2O passed through a

Chamberland filter and a collodian membrane. **III. The purification of our F preparation through dialysis.** HANS V. EULER AND O. SVANBERG. *Ibid* 110, 175-90(1920).—The carbohydrate content of the authors' sucrase F prepn. increased on dialysis through a collodion membrane until a certain max. was reached, at which it remained stationary. The N content diminished on dialysis. The authors conclude that sucrase consists chiefly of carbohydrates. Sucrase does not require a coenzyme for its activity.

H. V. ATKINSON

A conjugated nucleic acid from the pancreas. I. EINAR HAMMARSTEN. *Z. physiol. Chem.* 109, 141-65(1920).—This acid appears to be a compd. of one mol. of a tetra-nucleotide with 2 mols. of a guanyl deriv. Cf. *C. A.* 14, 2928.

H. V. ATKINSON

Yeast nucleic acid. S. J. THANNHAUSER AND P. SACHS. *Z. physiol. Chem.* 109, 177-88(1920).—This is a tetranucleotide composed of guanosine, adenosine, cytosine and uridine phosphoric acids.

H. V. ATKINSON

The action of alcoholic sodium acetate solution on cholesterol dibromide. A. WINDAUS AND H. LUDERS. *Z. physiol. Chem.* 109, 182-5(1920).—Metacholesterols are formed.

H. V. ATKINSON

Bile acid. VII. MARTIN SCHENCK. *Z. physiol. Chem.* 110, 167-71(1920); cf. *C. A.* 14, 1676.—A study of the oxidation products of bilianic acid ($C_{24}H_{34}O_8$) by HNO_3 . A product with the formula $C_{19}H_{25}O_{10}$ was obtained. **VIII.** Lithocholic acid. H. WIELAND AND P. WEYLAND. *Ibid* 123-42. **IX. The mechanism of the dehydration of bile acids.** H. WIELAND AND E. BOERSCH. *Ibid* 143-52.—Lithocholic acid is a normal constituent of the bile. The method of its isolation, its chem. properties, and its products of oxidation and dehydration are described.

H. V. ATKINSON

Taurine from herring flesh. E. BERNER. *Z. physiol. Chem.* 110, 172-4(1920).—About 0.03% of taurine was isolated from the flesh of the herring. It was identified crystallographically.

H. V. ATKINSON

Diffusion experiments with a highly active sucrase. H. V. EULER, A. HADELIUS AND O. SVANBERG. *Z. physiol. Chem.* 110, 190-216(1920).—The rate of diffusion is the same in pure water as in H_2O at the optimal acidity for the action of the sucrase. The mols. of the sucrase are not split up either by sucrose or by its products of digestion.

H. V. ATKINSON

The relation of the free amino groups to the lysine content of proteins. K. FELIX. *Z. physiol. Chem.* 110, 217-28(1920).—F. estd. the N titratable with formalin in hydrolyzed and non-hydrolyzed arachin, glycinin, and gelatin. The fraction which is pptd. by phosphotungstic acid after removal of other diamino acids contains some other nitrogenous substances besides lysine. Van Slyke's assertion that the free amino groups of non-hydrolyzed proteins contain $1/2$ of the N of the lysine is not justified.

H. V. ATKINSON

Maltase solution from yeast. R. WILLSTÄTTER, TR. OPPENHEIMER AND W. STREIBELT. *Z. physiol. Chem.* 110, 232-40(1920).—Water will ext. maltase from brewers' yeast. Neutrality should be maintained with ammonia since acids destroy maltase. A very active ext. was prepd. in this way.

H. V. ATKINSON

Hemostatic agents. A further note on the details in the process of assaying. HERBERT C. HAMILTON. *J. Lab. Clin. Med.* 6, 398-404(1921); cf. *C. A.* 14, 1735, 2937. A reply to Hanzlik (*C. A.* 15, 391). Additional data of results on horses are given to corroborate the author's original results on dogs.

E. J. C.

Lecithin. IV. Lecithin of the brain. P. A. LEVENE AND IDA P. ROLF. Rockefeller Inst. *J. Biol. Chem.* 46, 353-65(1921).—Dried ox brain was extd. with AcMe and then with EtO containing 5% H_2O . This ext. was concd. and treated with AcMe overnight at 10° . The ppt. was filtered out, the liquid concd. and the pptn. with AcMe repeated. This was repeated until no ppt. was obtained. The soln. was then

concd. and pptd. with EtOH. The ppt. was dissolved in Et₂O and repptd. with EtOH. This was repeated. The combined EtOH solns. were concd. and pptd. with AcMe. 100 g. of this prepn. were dissolved with gentle warming in 500 cc. HOAc and allowed to stand overnight in the refrigerator, the filtrate was poured into 10 vols. 95% EtOH and again placed in the refrigerator overnight. The filtrate was evapd. at room temp. under reduced pressure. Analyses of this prepn. and of the product obtained on hydrogenation showed it to be a lecithin containing oleic, palmitic and stearic acids. A similar prepn. was obtained from the AcMe ext. of the brain by sepg. most of the cholesterol by crystn. from EtOH and sepg. the lecithin as the CdCl₂ compd. This was purified by pptn. from the EtOH-H₂O soln. with AcMe, then 3–4 times from the same solvent with EtOH and finally from PhMe with Et₂O.

I. GREENWALD

Hydrogen sulfide formation from sulfates through the action of feces. R. KOCHMANN. *Biochem. Z.* **112**, 255–8(1920).—When Na₂SO₄ is added to either cat or rabbit feces *in vitro* and kept at body temp. there occurs a notable formation of H₂S. Na₂S₂O₃ or S alone is not reduced to as marked extent as is the sulfate but H₂S is nevertheless produced. This reducing power of feces is less in the cat than in the rabbit.

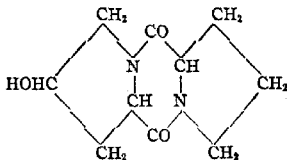
F. S. HAMMETT

Alteration in the inverting power of top yeast by pre-treatment. STURE LÖVGREN. *Fermentforschung* **3**, 221–40(1920).—The expts. were undertaken with the object of detg. the influence of the inorg. constituents on the formation of sucrose and the differences between their action on bottom yeast, which has generally been used previously by Euler and his co-workers, and on top yeast. Pre-treatment of the yeast was effected with sugar, AcONH₄, Mg chloride or sulfate, CaCl₂, KCl, NaCl, KH₂PO₄, yeast water, alc., acetone or carbamide, sometimes singly and sometimes in combination. The results are summarized in the following statements: (1) The neutral salts investigated do not appear to have any actual influence on the variation of the inverting power of the types of top yeast used, either in small amts. at the ordinary temp. or in larger quantities at the ordinary or higher temp. (2) Certain expts. indicate that the inverting power of top yeast may be distinctly increased by suitable pre-treatment. Addition of nitrogenous nutriment is advantageous, but not essential. In the first 24 hrs. (of fermentation) the inverting power increases slowly or may even decrease; after cessation of fermentation, it increases gradually at first, then more rapidly to a max., at which it remains for a time, and then slowly decreases again. The curves are more or less flattened according to the properties of the original yeast. (3) One expt. shows the top yeast is much less suitable for enrichment expts. of this kind than bottom yeast. (4) The inversion constns. of the original yeasts varied between 20 and 40, with a mean value (from 9 estns.) of 28 per g. of yeast (30% dry substance) and 9.6 g. of sucrose at 16°, from which the const. 3×10^{-12} is calcd. (5) If the increase of inverting power is considered to be a consequence of augmented vitality due to the pre-treatment, the N nutriment must be regarded as essential. The fact that a marked increase can occur without administration of N is probably explained by the formation of the necessary amt. of the latter by autolysis. J. C. S.

Taste. YRJO RENGVIIST. *Skand. Arch. Physiol.* **38**, 97–201(1918).—The taste system is composed of the sensory particles and their components and the liquid or soln.; it is thus a heterogeneous system, one part of which comprises the colloidal protoplasmic taste cells or nerve terminations, and the other the liquid or soln. The main changes which occur depend on alteration of surface and elec. energy. Equally marked sensations of taste must correspond with the adsorption of equal amts. of the substance by the organs of taste. The concn. necessary to induce taste with the alkali salts is an additive function of the inverse value of the rates of migration of the ions. The concn. for Ba and Ca chlorides is less than that for the alkali salts, while for AlCl₃ a minimum value is attained. Valency is, therefore, an important factor, and this

appears to indicate a suspensoid character of the adsorption in the system of taste. In addition to the rate of adsorption, elec. phenomena are important in their effect on the induction of taste by different electrolytes. The phenomena of the sensation of taste produced by homologous and isomeric compds. are explicable on the assumption that the process is one of adsorption. Exptl. investigation confirms the accuracy of a deduction from which it appears that the sensation of taste is more persistent with increasing concn. of tasted substance and increasing adsorption exponent, and with decreasing concn. and rate of diffusion. R. also examines the qualities of taste, their variation with differing concns. of electrolyte, and their relationships to the differences of potential caused by the electrolyte in the sensory system. The quality of the induced taste can be foretold with some degree of accuracy if the rate of migration of the ions of a univalent electrolyte and its concn. are known. The "compensation of taste" is a peripheral phenomenon which is observed in the sensory system—a bitter taste is not, however, compensated. The "fundamental tastes," sweet, bitter, and sour, are chosen, from which, in analogy to the Young-Helmholtz theory of color vision, all the various sensations of taste can be compounded. J. C. S.

Amino acids of gelatin. H. D. DARIN. Scarborough-on-Hudson. *J. Biol. Chem.* **44**, 499-529 (1920).—The total estd. amino acids from gelatin amount to 91.31%, to which must be added considerable additional amts. of serine and possibly allied substances not satisfactorily sepd. from the hydroxyproline; unidentified S derivatives also are present. The % of the amino acids found are as follows: glycine 25.5, alanine, 8.7, leucine 7.1, serine 0.4, phenylalanine 1.4, tyrosine 0.01, proline 9.5, hydroxyproline 14.1, aspartic acid 3.4, glutamic acid 5.8, histidine 0.9, arginine 8.2, lysine 5.9, NH_3 0.4. Aminobutyric acid, valine, isoleucine, and hydroxyglutamic acid were not present. Tyrosine was present in all the specimens of gelatin examd. but the amt. was not in excess of a fraction of 0.1% so that it is probably a safe deduction that this amino-acid is not an integral part of the gelatin mol.; the unsatisfactory methods of purifying gelatin undoubtedly account for the presence of traces of it as an impurity. Extn. with BuOH was employed for the sepn. of certain groups of amino acids; at ordinary pressure it readily removes alanine, leucine and phenylalanine, while serine and hydroxyproline are extd. more slowly. Proline can best be extd. under reduced pressure thus limiting secondary changes. The extn. of the hydroxyproline can be completed by using propyl alc. Gelatin is a very suitable material for the prepn. of optically pure leucine because it does not contain valine or isoleucine. γ -Hydroxyprolylproline anhydride, a new tricyclic peptide, the first to be obtained containing the hydroxyproline nucleus and unique in containing 3 rings; irregular prismatic crysts., very sol. in H_2O and alc., sparingly sol. in Et_2O and insol. in most other org. solvents, aq. soln. very feebly acid to litmus, forms no blue salt on boiling with CuO , does not react with Br water or HCHO and gives no N with HNO_3 , readily pptd. from concd. soln. by phosphotungstic acid, reduces AgNO_3 slowly on boiling, $\alpha_D^{20} -142^\circ$ in aq. soln., m. $102-3^\circ$ when crystd. from Et_2O , $135-40^\circ$ when crystd. from H_2O , present in the crude proline fraction obtained by extg. with BuOH under atm. pressure gelatin hydrolyzed by boiling for 12-20 hrs. with 31.6% H_2SO_4 by wt.



Inactive proline hydantoin, very sol. in H_2O and alc., readily sol. in Et_2O and Me_2CO .

sparingly sol. in CHCl_3 , crystallizes from aq. soln. in highly refractive hexagonal prisms m. $142-3^\circ$, which is distinctly lower than the active form. A. P. LOTHROP

The effect of compression on tissue enzymes. B. H. HIRT AND W. MORSE. West Virginia Exp. Stat. Lab. and Sch. of Med. *Proc. Soc. Exptl. Biol. Med.* 17, 132-3 (1920).—There is generally lee-way between the destruction of enzymes and the total destruction of bacteria in tissue preps. subjected to great pressure in a special hydraulic press. In order to det. whether this difference is sufficient to warrant an attempt to study tissue enzyme action apart from bacteria, studies were made on the effect of different pressures on rabbit liver; it was concluded that the greatest care s necessary to adjust the pressure so that complete inhibition of enzymes does not occur, while at the same time all bacteria are killed. The method is of doubtful practicability.

V. C. MYERS

The colloidal behavior of proteins. JACQUES LOEB. Rockefeller Inst. *J. Gen. Physiol.* 3, 557-64 (1921).—Neutral salts depress the osmotic p., swelling, and viscosity of protein-acid salts. By measuring the potential difference (P. D.) between gelatin chloride soln. placed in a collodion bag and an outside aq. soln., it was found that a salt (NaNO_3) depressed the P. D. in the same proportion that it depressed the osmotic p. Assuming that the P. D. is due to a difference in the H-ion concn. on the two sides of the membrane, the P. D. can be calcd. by the Nernst formula, $E = (RT/nF) \ln(C_1/C_2)$. The difference p_H inside minus p_H outside (of the membrane) is probably the result of the Donnan membrane equilibrium. It is supposed that one of the ions in the soln. cannot diffuse through the membrane. The non-diffusible ion may be either a crystalloid or a colloid. If acid is added to isoelec. gelatin, the osmotic p. increases with the increase in H-ion concn., reaching a max. at p_H 3.5, and then falls rapidly with the further addition of acid. The P. D. follows the same course except that the max. is reached at p_H 3.9. The same relation between osmotic p. and P. D. was found for a number of other gelatin salts. The P. D. can be calcd. from the difference between the inside and outside p_H . This is a preliminary paper; a more complete treatment will follow.

CHAS. H. RICHARDSON

Hydrolysis of α -methyl- β -mannoside by soluble enzymes. H. HÉRISSEY. *Compt. rend.* 172, 766-8 (1921).—The mannoside used in this study was prepared by the method of Fischer, and had a rotatory power $\alpha_D = +79.18^\circ$ ($v = 15$ cc., $l = 2$, $p = 1.2218$ g., $\alpha = 12^\circ 54'$). Confirming the work of Fischer it was found that an emulsion of almonds contained a trace of α - β -mannosidase, which produced a slight hydrolysis. Unsatisfactory yields were obtained with *Aspergillus niger*, beer yeast and mushroom mycelium. The best results were obtained from the germinating seeds of lucerne. The seeds were soaked in water several hrs., then allowed to germinate at $25-30^\circ$ for 48 hrs., when they were quickly dried at a temp. below 45° , and the dried product ground to a uniform powder. This powder was added to the mannoside soln. in the proportion of 4 to 5 g. per 100 cc. In 36 days the hydrolysis was 71.6% and in 49 days 94.73%. Also in *J. pharm. chim.* 23, 409-17 (1921).

L. W. RIGGS

Phthalate buffers—some incompatibilities. HARPER F. ZOLLER. *J. Am. Chem. Soc.* 43, 914-6 (1921).—When 0.1% crystal violet was added to the Clark-Lubs buffer mixts. covering the p_H range 1 to 10, the color changed in the HCl-KCl mixts. (p_H 1.0 to 2.2) from yellow-green through light blue to dark blue, but as soon as the HCl-K H phthalate mixts. (p_H 2.2 to 3.8) were reached, a greenish fluorescence appeared and pptn. occurred, the amt. of matter settling out seeming to bear a direct relation to the amt. of dissociated free phthalic acid; the zone of pptn. extends to p_H 4.4 (NaOH-K H phthalate), from which point the solns. are violet to 9.6, when the color begins to fade. The pptn. is not a H-ion effect, as it does not occur with acetic, citric, tartaric or propionic acid solns. of the same p_H , but buffer solns. prepd. with salicylic acid show a similar behavior. Evidence has been obtained that the dye and the

phthalate buffer form an addition compd. Again, impure lactalbumin in dil. soln. (0.01-0.001%) does not coagulate or flocculate at 60° in citrate or acetate buffers, but does readily with phthalate buffers between pH 2.4 and 5.0. K phthalate also noticeably lowers the thermal coagulation point of egg albumin. CHAS. A. ROULLIER

Colloid chemical importance of physiological ionic antagonism and of equilibrated salt solutions. S. M. NEUSCHLOSZ. *Arch. ges. Physiol. (Pflüger's)* 181, 17-39 (1920).—Because of the association of lipoids with living processes within the cell it would appear that many physiol. phenomena involving the activity of ions may be essentially colloidal chem. reactions rather than reactions purely chem. in character. Thus, the effect of ions upon a lipid soln. (lecithin) was detd. Stalagmometric measurements of the lecithin soln. before and after the addition of various single salts in different concns. or mixts. of salts in variable relative concns. showed definite modifications in the surface tension. With the chlorides of Na, K, Ca, Mg and Al there were fairly const. relationships manifested, in that in employing solns. varying from 1 mol. to 1/512 mol. the greatest modifying effect (an increase in surface tension) was observed in the 1/8, 1/16, or 1/32 mol. concns. Concns. both above and below this optimum approached the figures for the lecithin soln. alone. Thus, with a lecithin soln. (1%) the surface tension value was 75.9 and after the addition of an equal vol. of the cation in its most active concn. the corresponding figures were; with Na^+ and K^+ in 1/8 mol. soln. 94.5 and 93.2; with Ca^{++} and Mg^{++} in 1/16 mol. soln. 94.8 and 93.9; and with Al^{+++} in 1/32 mol. soln. 96.4. When mixts. of salts were employed a marked antagonistic effect was revealed. With mixts. of NaCl and KCl modifications in surface tension were associated less with the abs. concn. of salt than with the relative amts. of Na and K present. At a ratio of Na : K = 1 : 1 the max. change occurred while at the ratio 1 Na : 1/20 K or 1 K : 1/20 Na the solns. appeared to be in equil. With Ca and Mg also the point of equil. was reached at the ratio of 1 : 20. With Al the ratio was 1 Na : 1/100 Al. With mixt. of the 3 chlorides of Na, K, and Ca the equilibrated soln. was 1 Na : 1/50 K : 1/50 Ca, the proportions in which these salts are to be found in serum. Titrations made of the action of the ions in lecithin solns. rendered acid or alk. by the addition of 1/2000 mol. HCl or NaOH showed that acid decreases the antagonistic action of Ca ions and increases that of K, while alkali induces the reverse. These findings reveal a close parallelism between colloid chem. ion antagonism and physiol. processes. The physico-chem. basis of ionic antagonism is found in the capacity of the cations for mutual replacement from their adsorption compds.—in this particular instance the surface of the particles of lecithin. The displacing ion does not assume the place of the one displaced. With Na and K there is a complete mutual compensation in the ionic activity. For while the relation 1 Na : 1/20 K is well known in physiol. equilibrated solns. the reverse ratio appears to have no analogy in biology. G. H. S.

Influence of neutral salts on enzyme action. S. M. NEUSCHLOSZ. *Arch. ges. Physiol. (Pflüger's)* 181, 45-64 (1920).—The chlorides of the alkalis, the alk. earths, and of Mg exerts an inhibiting effect upon the cleavage of sucrose by invertase. This inhibition increases somewhat with increasing concn. of the salt but is primarily related to the valence of the cation used, Ca, Sr, and Mg being decidedly more active than Na and K. The connection between salt concn. and enzyme inhibition may be shown by the changes in the coeff. of the adsorption isotherm. With Ca, Sr, and Mg this coeff. is essentially higher (12×10^{-2}) than for the cations Na and K (about 4×10^{-2}). The effect of salts on fermentation parallels the disperseness of the soln. enzyme, from which it appears that enzyme inhibition by neutral salts is due to a diminution of the active surface of the enzyme. Two cations in mixt. manifest an antagonistic action in their inhibition. When of the same valence the 2 cations present a max. antagonism in a relative concn. of 1 : 1. The coeff. of the adsorption isotherm has its minimal value when the ionic antagonism is at its max. value. G. H. S.

The self-regeneration of an enzyme after metal poisoning. HANS V. EULER AND OLOF SVANBERG. *Arkiv. Kemi, Mineral. Geol.* 7, No. 27, 30 pp. (1920); cf. *C. A.* 14, 3431.—A study of the reactivation of sucrase after poisoning by mercuric or silver salts. A number of tables are given showing the effect of concn. and temp. both on the poisoning and the reactivation. The reactivation proceeds spontaneously to a fixed value, which is independent of the amt. of poison. The temp. coeff. of the rate of poisoning is very large. The analogy between the reactivation and the so-called "Danysz" effect is emphasized.

E. D. WILLIAMSON

ABDERHALDEN, E.: *Lehrbuch der physiologischen Chemie mit Einschluss der physikalischen Chemie der Zellen und Gewebe und des Stoff- und Kraftwechsels des tierischen Organismus*. 4th Ed. 2 Vols. Berlin and Wien: Urban und Schwarzenberg. 799 and 722 pp.

BOHN, GEORGES AND DRZEWINA, ANNA: *La chimie et la vie*. Paris: Bibliothèque de philosophie scientifique. For review see *Rev. sci.* 59, 96 (1921).

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B—METHODS AND APPARATUS

STANLEY R. BENEDICT

A colorimetric method for the determination of arsenic in urine and blood of patients treated with arsphenamine, etc. KURT SCHEFFLER. *Z. angew. Chem.* 34, Aufsatzteil, 5-7 (1921).—This method is a modification of that of Bettendorf, in which the As compd. is reduced with SnCl_2 . The org. matter is previously destroyed by digestion preferably with a mixt. of H_2SO_4 and HNO_3 (1:4). S. recommends the following procedure: 100 cc. urine is evapd. to $\frac{1}{6}$ vol. in a porcelain dish, treated with 25 cc. of the above acid mixt., and evapd. to a consistency of concd. H_2SO_4 . The yellow mixt. is washed into a 100-cc. Kjeldahl flask with several 5-cc. portions of the acid mixt. and heated on a wire gauze. If the contents are light brown or black, the flask is heated 15 mins. longer and 2 cc. more of the acid added. The soln. becomes light yellow and finally colorless. It is boiled gently for 20 mins. to expel the last traces of HNO_3 , which would later react with the SnCl_2 . The vol. should now be about 5-7 cc. of a colorless, sirupy liquid; this is dild. to 25 cc. and 75 cc. of Bettendorf's reagent added. The soln. is boiled a short time and allowed to stand $\frac{1}{2}$ hr. The estimation is then made by direct comparison in a Hahnemann cylinder. The method is very accurate; 0.05 to 0.04 mg., or by careful work as little as 0.03 mg. As per 100 cc. urine can be detd. by this method. The use of dil. HCl (sp. gr. 1.12) is recommended in the prepn. of the Bettendorf reagent.

A. L. BARKER

The preparation of animal nucleic acid. E. J. BAUMANN. Montefiore Home and Hosp. *Proc. Soc. Exptl. Biol. Med.* 17, 118-9 (1920).—A method is proposed which gives yields from different glandular tissues of 0.8 to 1.5%. Fresh, ground glandular tissue is mixed with twice its wt. of tap H_2O and 100 cc. of 50% NaOH for each kg. of tissue; it is then heated until all except the connective tissue dissolves (40-70°). This is neutralized hot with strong CH_3COOH to a distinct acid reaction to litmus, brought to boiling and filtered hot on large folded filters. To an aliquot of 200 cc. of cooled filtrate concd. HCl dild. with an equal vol. of H_2O is added from a buret until pptn. is complete; an excess is carefully avoided. If the nucleic acid does not flock out after the soln. has been quiescent for several minutes, the same process should be repeated

upon another aliquot after addition of 5% of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$. A proportionate quantity of acid is then added to the bulk of the soln. The ppt. of nucleic acid is washed with 60, 80, and twice with 95% alc. by decantation, filtered on hardened filter paper, washed again with 95% alc. and finally with ether and then rapidly dried at about 70° .

V. C. MYERS

The determination of calcium in blood and plasma. G. W. CLARK. Univ. Calif. *Proc. Soc. Exptl. Biol. Med.* 17, 136-7(1920).—The method consists in a direct pptn. of the Ca without removal of the blood proteins. *Blood*.—Citratd blood (5 cc. in a 50-cc. centrifuge tube), is hemolyzed by the addition of 4 vols. (20 cc.) of warm H_2O and after standing 15 to 20 mins. is centrifuged to remove the stroma. An aliquot (20 cc.) of the clear, red liquid is transferred to a 50-cc. centrifuge tube. One cc. of 5% NH_4Cl is added and, after mixing, 3 cc. of 3% $(\text{NH}_4)_2\text{C}_2\text{O}_4$ are slowly added. (The chloride and oxalate solns. should be adjusted approx. to p_H 7.4.) The contents of the tube are well mixed and allowed to stand at least 16 hrs., then centrifuged and the supernatant liquid is siphoned off. The tube is washed by the addition of 25-30 cc. cold H_2O and immediately centrifuged. After removal of the wash H_2O the ppt. is dissolved in 5 cc. approx. N H_2SO_4 and, after heating in a H_2O bath to 75° , the contents are titrated with 0.01 N KMnO_4 . *Plasma*.—Citratd plasma (5 cc. in a 50-cc. centrifuge tube) is dild. with an equal vol. (5 cc.) of 1% NH_4Cl and 10 cc. of 1% $(\text{NH}_4)_2\text{C}_2\text{O}_4$ are slowly added. After it has stood 16 hrs. the ppt. is centrifuged, washed and titrated as in the procedure for blood. The accuracy of the method lies between 5 and 7%.

V. C. MYERS

A simple spectrometer for laboratory use. GÜNTER SCHEIBE. *Z. physiol. Chem.* 110, 229-32(1920).—A description of a comparatively inexpensive form of spectrometer which has sufficient accuracy for ordinary purposes in a physiol. lab.

J. C. S.

The technic of urine acidimetry (especially for clinical purposes). W. BIEHLER. *Z. physiol. Chem.* 110, 298-306(1920).—The H-ion concn. of urine calcd. from titration figures differs from values obtained by direct estn. of the H-ion concn. By plotting curves from the values obtained by the two methods, it is seen that there is a relationship between the two sets of results. It is suggested that the real H-ion concn. can be obtained by titration and comparing the two curves.

J. C. S.

A method of purifying certain kinds of proteins (preliminary paper). ADA M. FIELD. *J. Am. Chem. Soc.* 43, 667-8(1921).—Any protein with an iso-electric point at a H-ion concn. greater than that of H_2O will lose any combined basic elements when dialyzed sufficiently long against dil. acid and the resulting acid-protein compd. can then be completely hydrolyzed and the acid removed by dialysis against pure H_2O ; similarly a protein with the iso-electric point at a H-ion concn. below that of H_2O can be purified by treating first with dil. alkali and then with H_2O . The method was applied to gelatin (iso-electric point at C_H 2.5×10^{-3}). The properties of the purified gelatin and the applicability of the method to the purification of egg albumin are being investigated.

CHAS. A. ROUHLER

Preparation and investigation of thrombin. MAX BLIEBTRU AND EDGAR ATZLER. *Arch. ges. Physiol. (Pflüger's)* 181, 130-40(1920).—The ferment solns. are prepd. by dissolving 1 g. of powdered casein in 100 cc. of serum by means of shaking. The addition of acetic acid produces a ppt. which is dried *in vacuo* and pulverized. A 10% soln. is prepd. in water rendered alk. with NaOH. After neutralization purification is effected by pptn. with colloidal $\text{Fe}(\text{OH})_3$, satd. MgSO_4 soln. and alc. The filtrate is preserved in the cold and is dild. with an equal vol. of distd. water before use. Adsorption compds. are formed between the casein and thrombin and metathrombin. When dried and pulverized the prepn. will remain stable for at least a year and solns. prepd. from it have been effective in the treatment of hemorrhage. In the elec. field thrombin and metathrombin migrate to the anode.

G. H. S.

Determination of reducing sugars in the liquids of the organism. Critical study of a micromethod by O. Folin and H. Wu. CH. O. GUILLAUMIN. *J. pharm. chim.* 22, 327-38, 378-90(1920).—G.'s method is that of G. Bertrand (*C. A.* 1, 1630; 4, 1635), modified by using less of the Cu-alk. reagent. This enables detn. of sugar in only 16 to 8 cc., even 4 cc. of total blood in normal glucemia. The mode of taking the sample, defecation with Patein's reagent, and reduction and titration are described in detail. The processes of pptn. of Cu_2O by steam heat in a special app., sepg. and washing Cu_2O by aid of a centrifuge, adding the ferric salt and titrating with KMnO_4 , all take place in the same tube, which largely prevents oxidation by air. A table is given, showing the relation between cc. of $1/10$ N KMnO_4 and mg. of dextrose. The method is simple and as accurate as others requiring 20 cc. of liquid. Folin and Wu's method (*C. A.* 14, 2353) is even more sensitive. G. finds, however, that the color intensity is not proportional to the sugar content, but increases more rapidly than the latter. This precludes direct calcn. of the sugar content from the heights of liquid columns of equal color intensity. G. using the Duboscq colorimeter in bright daylight, gives 3 empirical tables in which the sugar content in mg. is read off from the height in mm. of the liquid to be examd. when brought to the same color intensity as that obtained with F. and W.'s standard sugar solns. under definite thicknesses. Comparing results with those by his own method, G. finds that both agree well in cases of normal blood. In pathological conditions where reducing non-sugars, e. g., urea, uric acid and creatinine accumulate, F. and W.'s method gives higher results because Patein's reagent removes these substances more effectually than does tungstic acid. G. finally applies the modified F. and W. method to the detn. of sugar in the cerebrospinal liquid. By means of 2 additional empirical tables for very small amts. of sugar, and by proper dilns. of the standard, an extremely sensitive and accurate method is obtained, indicating as low as 0.025 g. of sugar per l. S. WALDBOTT

Electron tube with variable resistance (STEINHAUSEN) 1.

DOMARUS, A. V.: *Methodik der Blutuntersuchung, mit einem Anhang Zytodiagnostische Technik*. Berlin: Julius Springer. 489 pp. M. 58.

MYERS, VICTOR C.: *Practical Analysis of Blood*. A Book Designed as a Brief Survey of this Subject for Physicians and Laboratory Workers. St. Louis: C. V. Mosley Co. 121 pp. \$3.

C—BACTERIOLOGY

A. K. BALLS

Proteins of colon bacteria. E. SALKOWSKI. *Z. physiol. Chem.* 109, 45-56(1920).—An albumose and a globulin are present. Both contain S and lack tryptophan. For the detection of tryptophan mix equal vols. of 1-50,000 formalin and concd. HCl, add 3 drops of 3% FeCl_3 , about 0.1 g. of the protein and then heat to boiling. A violet or blue color indicates the presence of tryptophan. H. V. ATKINSON

Observations on the use of citrated media. H. C. BROWN. Wellcome Res. Bur. *Lancet* 1921, I, 22-3.—The addition of Na citrate to media inhibits the growth of some organisms and favors growth of others. The increase in growth is not due to changes in reaction of the medium. The dissociation of Na citrate by certain organisms can be demonstrated by the addition of Pb acetate to a 48-hr. culture. Certain organisms produce gas in a simple citrate fluid medium. Citrated medium forms an easy means of differentiating the true cholera vibrio from certain other vibrios, paratyphus A from B and C, and certain types of *Streptococcus fecalis* from others. E. B. FINK

The action of ultra-violet rays on the Saccharomycetes. R. DE FAZI. *J. Ind. Eng. Chem.* 13, 265(1921).—Polemical against Feuer and Tanner (*C. A.* 14, 2651). Reply. BERTRAND FEUER and F. W. TANNER. *Ibid* 265-6. N. KOPLOFF

Botanical researches on several new species of bacteria which can use urea or

hippuric acid as the only organic food. C. STAPP. Univ. Marburg. *Centr. Bakt. Parasitenk., Abt. II* 51, 1-71 (1920). Thirty-five such species are described in detail.

JULIAN H. LEWIS

Variation in bacteria in relation to agglutination both by salts and by specific serum. J. A. ARKWRIGHT. *J. Path. Bact.* 24, 36-60 (1921); cf. *C. A.* 14, 3260.—Eight out of nine strains of *B. dysenteriae* (Shiga) yielded two forms when grown on ordinary solid media. "R" form, which was spontaneously agglutinable, and "S," which was not. Both forms remain const. when cultured weekly in broth. They differ in their growth in broth and on agar but are identical as regards sugar reactions and absence of indole formation. The ninth strain grew only in the R form. The S form makes stable emulsions in 0.85% NaCl soln., but the R form agglutinates. The R form and many other spontaneously agglutinating strains can be tested against specific sera when the salt soln. 0.4% to 0.1%, stable emulsions being formed. The two forms differ decidedly in their agglutinating, antigenic, and absorbing properties with specific sera. S and R forms were obtained from one strain of *B. dysenteriae* (Flexner), and from several strains of *B. typhosus*. A long bibliography is appended.

JOHN T. MYERS

Methods of isolation and identification of the members of the colon - typhoid group of bacteria. Further studies on C. R. indicator. J. BRONFENBRENNER, D. SOLETSKY and M. J. SCHLESINGER. Harvard Medical School. *Procl. Soc. Exp. Biol. Med.* 17, 25-26 (1919); cf. *C. A.* 13, 461.—The authors have described previously an indicator for the direct measurement of H-ion concn. in growing bacterial cultures. This indicator is a mixt. of China blue and rosolic acid, and covers the range of changes between $C_H = 1 \times 10^{-9}$ and $C_H = 5 \times 10^{-5}$. This combination offers an indicator which has a faint gray tinge at the neutral point, with pure blue (due to China blue) on the acid side and pink (due to rosolic acid) on the alkaline side. This indicator can be used only for the study of Gram-negative organisms, as the rosolic acid exerts bactericidal action against the Gram-positive organisms. For this reason, the authors suggest the use of corallin instead of the rosolic acid, since the color and turning point are much the same, and the corallin has no bactericidal action upon the organisms.

V. C. MYERS

Influence of luminous radiations on *Azotobacter*. E. KAYSER. *Compt. rend.* 172, 183-5 (1921).—In a previous paper, *C. A.* 15, 873, K. shows that yellow radiations are the most favorable for the fixation of N. The object of the study reported in the present paper was to learn if this property remained constant during a series of generations, or if variable to detn. the laws of its variations. Cultures containing 1.81% glucose, 1.293% mannitol and the usual mineral salts were exposed to yellow, green and blue radiations. Cultures exposed to white light and others kept in darkness served as controls. In each test cultures were made with the 3rd and 6th generations of *Azotobacter*. In every case cultures from the 3rd generation fixed more total N. The difference in N fixed by the 2 generations was greatest with white radiations followed by darkness, green, yellow and blue in order. In the darkness and with yellow rays more N was fixed per g. of carbohydrate consumed by the 6th than by the 3rd generation. With white, green or blue the reverse was the case. If the N for both generations is combined, white and yellow produce a greater total N than the other colors but they also consume a much larger wt. of carbohydrate. Cf. following abstract. L. W. RIGGS

Influence of luminous radiations upon *Azotobacter*. E. KAYSER. *Compt. rend.* 172, 491-3 (1921); cf. preceding abstract.—K. has continued the work reported in previous papers, and studied the fixation of N by *Azotobacter* of the 12th generation under the same colored rays and under a change of color. *Azotobacter* which had been cultivated to the 12th generation under yellow rays were placed in 2 sep. glasses containing the nutritive medium, one was exposed to yellow rays and the other to blue

rays, and so on for the other colors. In every instance the 12th generation fixed less total N than the 6th. Change of color in the light was followed by increased total N fixation in 5 out of 6 cases, and by increased N per g. of carbohydrate destroyed in 4 out of 6 cases.

L. W. RIGGS

The effect of salt proportions and concentrations on the growth of *Aspergillus niger*. C. M. HARNSELER. *Am. J. Botany* 8, 147-67 (1921).—Shive's 3-salt nutrient solns. employing KH_2PO_4 , $\text{Ca}(\text{NO}_3)_2$ and MgSO_4 in varying proportions according to the triangle diagram was used in the study. *A. niger* was grown on 3-salt solns. of total concns. equiv. to 0.5, 2.1, and 4.2 atms., resp. For each total concn. 36 solns. were made, representing all the possible combinations obtained by varying the partial concns. of each of the salts by increments of $1/10$ of the total concns. A number of solns. in which the salt proportions and total salt concn. remained the same, but with sugar concn. varying from 1 to 8 atms. by increments of 1 atm. was also tested. In solns. all with the same salt proportions, an increase in total concn. gave a corresponding increase in yield. The partial concns. of KH_2PO_4 and MgSO_4 were varied within wide limits without in any way affecting the yields. Yield in dry wt. of fungus is approx. proportional to the amt. of NO_3 present in the culture, whether this is produced by increasing total concn. and leaving salt proportions unchanged, or by changing salt proportions and leaving total concn. the same. With a sugar soln. having an osmotic concn. value of 3 atms., the limit of growth in the $\text{Ca}(\text{NO}_3)_2$ cultures was between 0.9 and 1.0 g., regardless of the amt. of salts present. NaNO_3 as the source of NO_3 produced poorer yields than did $\text{Ca}(\text{NO}_3)_2$. In cultures with const. salt proportions and total salt concns. but with varying sugar concns., the dry wts. of fungus were very nearly proportional to the sugar concns. of the cultures.

J. J. SKINNER

Effect of starvation on bacteria. H. BRAUN. *Z. allgem. Physiol.* 19, 1-8 (1921).—Expts. were conducted to det. the effect of under-nourishment upon bacteria. Upon nutrient agar *B. proteus* grows with the typical spreading colony and each organism when examd. microscopically will show well developed flagella. If the same races are cultivated upon an agar containing but $1/10$ as much nutrient material and salts, isolated colonies with no spreading are formed. Under microscopic examn. only an occasional rod will show motility and when stained the majority of organisms lack flagella. Continued subculture on such a medium results in complete loss of motility, and the typical bacillary form is lost, the cells becoming much smaller and egg-shaped, closely simulating cocci. The same structural changes and physiol. alterations take place if the organisms are cultivated upon a medium of abundant food supply but containing various germicidal substances in sublethal amts. Apparently the disinfectant alters the bacterial metabolism. *B. typhosus* and *B. paratyphosus* under similar conditions of dietary deficiency also lose their organs of locomotion in large part and show definite atypical serologic relationships. Typhoid strains from a standard medium with adequate food supply induce the formation of antibodies (agglutinins) capable of reacting with all typhoid antigens. Sera produced with an antigen grown on a medium of low food value will agglutinate an antigen consisting of "under-nourished" organisms in high dilns. but they are relatively inert when combined with the normal antigens. Absorption expts. showed that sera produced with a normal antigen can be absorbed completely by a normal antigen, but when combined with an "undernourished" antigen only the agglutinins for that type were absorbed. On the other hand, sera produced by the injection of the "under-nourished" antigen are absorbed completely by both types of antigen. Thus, deficient nourishment must affect the endoplasmic compn. as profoundly as it modifies ectoplasmic morphology. Such variations in growth conditions does not alter susceptibility to chemicals or to heat, nor is virulence modified. The changes effected are not permanent, although after 30 generations upon an unfavorable medium the organisms are so altered that when restored to a

normal nutrient agar they revert to type with extreme slowness and by slight gradations.

G. H. S.

Notes on *Bact. coli* and *Bact. aerogenes*. MAX LEVINE. State Univ. of Iowa. *Am. J. Public Health* 11, 21-3(1921).—The author found that (1) *B. coli* would not grow in 1/2 percent peptone with crystal violet in a diln. of 1-200,000, or brilliant green in a diln. of 1-1,000,000; (2) that bile salts stimulated the growth of *B. coli* when the concn. was less than 0.5 percent, but showed a marked inhibitory action if the concn. was raised to 0.7 or 1.0 percent. Preliminary studies indicate that the concn. of peptone exerts a marked influence on the inhibitory action of dyes in culture media, and that it appears feasible to devise both liquid and solid media which will inhibit *B. coli* but not *B. aerogenes*.

N. VAN PATTEN

Titration curves of certain liquid culture media. JOANNE L. KARBUR AND ROBERT W. WEBB. *Ann. Missouri Bot. Gardens* 7, 299-305(1920).—A study of the growth of various fungi and of the germination of various fungi spores with reference to H-ion concn. has involved a detn. of the titration curves of several culture media. Titration curves and data for *beet decoction* (consisting essentially of 370.4 g. of sugar beets per l. of distd. water, autoclaved at 15 lbs. for 1 hr. and filtered), *Czapels's solution* ($MgSO_4 + 7H_2O$, 0.5 g.; KH_2PO_4 , 1.0 g.; KCl 0.5 g.; $NaNO_3$, 2.0 g.; $FeSO_4$, 0.01 g.; cane sugar, 30.0 g.; distd. H_2O , 1000 cc., *peptone solution* (20 g., bacto-peptone in 1000 cc. H_2O), *Pfeffer's solution* (KH_2PO_4 , 5.0 g.; $MgSO_4 + 7H_2O$, 2.5 g.; NH_4NO_3 , 10.00 g.; $FeSO_4$, trace; cane sugar 50.0 g.; distd. H_2O , 1000 cc.), and *Richard's solution* (KH_2PO_4 , 0.5 g.; KNO_3 , 4.0 g.; $MgSO_4 + 7H_2O$, 0.5 g.; NH_4NO_3 , 10.0 g., $FeSO_4$, trace; cane sugar, 30 g.; distd. H_2O , 1000 cc. are given. References are included.

NATHAN VAN PATTEN

The adaptation of a yeast to galactose. HANS V. EULER AND INGVAR LAURIN. *Arkiv Kemi, Mineral. Geol.* 7, No. 28, 11 pp.(1920).—A number of tables are given showing the acceleration of the fermentation of galactose by aq. and alc. exts. of yeast. In many cases, while the action is accelerated, no increase in cell number can be observed, and in the other cases the effect is much greater than the corresponding cell increase. It is suggested that during the process of extn. of carefully dried yeast the cells reach a state in which they have much more than normal fermentation power but lack the power of further growth.

E. D. WILLIAMSON

Relation of lactic acid bacteria to corn silage (FRED, *et al.*) 12.

DÉRIBÉRE-DESGARDES: Formulaire des milieux de culture en microbiologie. Paris: Le Franois, 91, boulevard Saint-Germain. 4 fr. For review see *Rept. pharm.* 33, 31(1921).

D—BOTANY

CARL L. ALSBERG

The chemistry of succulents. KARL BRANHOFER AND JULIUS ZELLNER. *Z. physiol. Chem.* 109, 12-5(1920).—The Ca malate, reducing sugar, sucrose and pectin content of *Sedum telephium*, *Sempervivum hertum*, *Aloe vera*, etc. are given. The H_2O -sol. substances are greater than in the mesophytes.

H. V. ATKINSON

Effect of time of irrigation on kernel development of barley. H. V. HARLAN AND S. ANTHONY. Bur. of Plant Industry. *J. Agr. Research* 21, 29-45(1921).—The length, lateral diam. dorsoventral diam., solids, N and ash data are given for the kernels of barley grown at Aberdeen, Idaho, and graphs are presented showing these changes. The deposit of dry material in the kernel continues until the time of absolute ripeness is almost reached. The plants utilize H_2O up to the time of full maturity. Late irrigation results in a greater activity and a later maturity. A deficiency of H_2O even after the spikes are losing their color, results in checking the deposit of dry matter. A deficiency of H_2O earlier in the development of the kernel probably dets. the size of the kernel, even before the rate of deposit of dry matter is checked. F. C. COOK

Growth and sap concentration. H. S. REED. Univ. of Calif. *J. Agr. Research* 21, 81-98(1921).—Data on young walnut, apricot and orange trees are recorded. In a rapidly growing shoot there is generally a lower concn. of sap, while slower growth is accompanied by higher concns. of sap. There was a gradual increase in sap concn. as the season advanced. Of several environmental factors measured soil moisture was the only one having an obvious effect upon sap concn. F. C. COOK

Occurrence of chelidonic acid. E. STRANSKY. *Arch. Pharm.* 258, 56-9(1920); *J. Chem. Soc.* 120, 1, 85-8.—The cryst. ppt. obtained by the fractional pptn. of the cold H_2O ext. of *Convallaria majalis* by means of $Pb(OAc)_2$ soln. was identified as the lead salt of chelidonic acid, the occurrence of which has previously only been noticed in *Chelidonium majus*, *Veratrum album* and *Buphane disticha*. As chelidonic acid is quant. converted by boiling milk of lime into 1 mol. of acetone and 2 mols. of $H_2C_2O_4$, this reaction was utilized for the detection and estn. of the acid in *Convallaria* and other plants in which, on account of its close relationship to $H_2C_2O_4$, it was thought it might be present. The largest amt. found was 2.09-2.18% in the leaves of *Convallaria majalis*. A high %, 1.42-1.53, was found in an entirely new source, namely sabadilla seeds. *Chelidonium majus* contained 0.14-0.74%, according to the season and the particular part of the plant. In certain *Veratrum* sp., 0.04-0.39% was found, and traces were indicated in various other liliaceous and amaryllidaceous plants. Physiological expts. indicated that chelidonic acid passes through the animal organism for the most part unchanged. W. O. E.

Investigation of Plantago coronopus. L. E. EMMANUEL AND M. PAPAVALION. *Arch. Pharm.* 258, 142-7(1920); *J. Chem. Soc.* 118, 1, 802.—The plant is indigenous to Greece and neighboring countries, its prepus. being used as powerful diuretics. The seeds yield 44.2% mucus and 4.6% of a water-sol. gum which shows the reaction of the pentoses, and is converted by HNO_3 into mucic acid. The entire plant exclusive of seeds was exhaustively extd. with 95% alc. The concd. ext. deposited small quantities of chlorophyll and NaCl. The filtrate was dild. with aq. SO_3 , and the resulting ppt. sepd. by Et_2O into insol. *plantagenic acid*, $C_7H_{12}O_7$, m. 210° (the *Ag salt* was analyzed), and sol. resin, acid no. 73.39, sapon. no. 158.7, from which NaOH soln. extd. *coronopic acid*, $C_{14}H_{16}O_8$, amorphous mass, m. $281-2^\circ$, while from the portion left after this treatment a pale yellow mobile essential oil, n_D^{20} 1.6893, was obtained in very small amt. by distn. with steam, the remainder consisting of a resin, m. $128-30^\circ$, which evolved $BzOH$ when heated on a Pt foil. The presence of bitter principles or glucosides could not be detected, but emulsin and invertin were found by Bourdier's method. The plant yields 7% ash containing Al, Mg, Na, K, SiO_2 , Cl, P_2O_5 and SO_3 . The presence of Li was not detected. The diuretic action of the plant, which has frequently been attributed to the latter element, is probably due to its high content in mucus. W. O. E.

Note on the formation of hydrocyanic acid in plants. PAUL MENAUL. Oklahoma Agric. Expt. Sta. *J. Biol. Chem.* 46, 297(1921).—Two flasks each containing 400 cc. H_2O satd. with CO_2 , 2 cc. 40% $HCHO$ and 1 g. KNO_3 were made alk. to phenolphthalein with Na_2CO_3 ; two others were made alk. to Me orange but acid to phenolphthalein and two were made acid to Me orange. All were stoppered and exposed to sunlight for 1 month. The contents were then tested for HCN by the formation of CNS⁻ (Menaull and Dowell, *C. A.* 14, 961). The first pair of flasks contained none, the second a trace, but the third contained 6 mg. HCN in each flask. The expt. is taken to indicate that HCN may be formed in plants by the action of $HCHO$ on nitrates.

I. GREENWALD

Function of alkaloids in plants. G. CIAMICIAN AND C. RAVENNA. *Atti accad. Lincei* 29, 1, 416-20(1920); cf. *C. A.* 14, 2810; 15, 547.—It has been found that, unlike salts of quaternary bases, betaine exhibits only slight toxicity for bean plants, but examn. of a large amt. of a tartaric acid ext. of these plants fails to reveal the pres-

ence of betaine, although small proportions of choline and trimethylamine are detectable (cf. Pictet and Court, *C. A.* 2, 115). Certain of the views expressed by Bernardini (*C. A.* 14, 2853) are traversed, and the statement that the seed of the tobacco plant contains no nicotine is denied. J. C. S.

The circulation of the mineral substances in leaves. LUIGI MONTMARTINI. *Alli ist. botan. Univ. Pavia* 17, 227-55(1920).—A passage of a certain quantity of mineral substances takes place during the night from the green leaves of plants towards the stem in addition to that of the org. substances that have accumulated as products of chlorophyllous photosynthesis. Though in most cases the disappearance of mineral substances is less than that of the org. substances so that a greater % of ash is contained in the leaves in the morning than on the preceding evening, the reverse is sometimes true. Among the mineral substances taking part in this phenomenon are (with some exceptions) first, Ca and then P and K. Si and S are not involved. The displacement of the mineral substances, especially that of the Ca, is proportional to the chlorophyllous assimilation. Ca is removed chiefly during the first hrs. of the night while the other elements have a more uniform movement during the night. The circulation of the Ca is linked with that of the carbohydrates. The Kohn hypothesis that very diffusible sol. compds. are formed with the Ca which pass by osmosis from cell to cell and whose velocity of circulation is proportional to the density of the soln. in which they are found (therefore, greatest during the early hrs. of the night when they are most abundant) appears very probable. The K and the P probably form compds. of a different character which circulate more uniformly and, as thought by Ivanov in the sieve tubes. ALBERT R. MERZ

Researches on the chemical constitution of the membrane of the cyanophyceous algae. EVA MAMELI. *Alli ist. botan. Univ. Pavia* 17, 257-64(1920).—About 100 species belonging to 34 genera of *Schizophyceae* were examd. Cellulose was found in all. This is generally accompanied by a pectic substance. Chitin could not be detd. as present in any. The hydrolytic products of the cellulose are pentosans and galactans. The cellular membrane of the *Schizophyceae* living symbiotically in lichens behaves microchemically the same as that of the free *Schizophyceae*. A. R. M.

Enzymes of pollen. JULIA B. PATON. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 60-1(1919).—The significance of pollen enzymes in rendering stored food available in pollen germination, in aiding the passage of the pollen tube through the pistil, and in stimulating the development of the embryo and maturing of the ovary is emphasized. Pollen enzymes may be concerned in pollen anaphylaxis. P. has tested the pollen of castor lily, *Lilium rubrum*, red maple, Norway maple, Siberian crab apple, Austrian pine, magnolia, dandelion, goldenrod, ragweed, and corn, and has found amylase, invertase, catalase, reductase, and pectinase in all, erepsin, pepsin, trypsin and lipase in some, and zymase in Siberian crab apple only. Cytaase and tyrosinase have not yet been satisfactorily identified in any. Other pollens are being examd. V. C. MYERS

Some points of interest concerning the cocklebur and its seeds. J. S. MCHARGUE. Kentucky Agr. Exp. Sta. *Ecology* 2, 110-9(1921).—Under natural conditions the germination of the smaller of the pair of seeds in the bur of *Xanthium* is usually delayed. This has been ascribed to a true dormancy of the seed. In the case of *X. commune*, at least, the delayed germination is due to the mechanical condition of the bur. When removed from the bur, the smaller and larger seeds germinate at approx. the same time. The larger seeds produce somewhat larger and more vigorous plants. The chem. compn. and cell structure of the two seeds are similar. T. G. PHILLIPS

Distribution of nitrogen in the alfalfa seed. HARRY G. MILLER. *J. Am. Chem. Soc.* 43, 906-13(1921).—The 0.5% KOH ext. of the seed filters easily after the carbohydrate material has been pptd. by doubling the vol. with 80% alc. The protein

pptd. by adding AcOH to the alk. ext. represents 60% of the total N. Analysis of this protein by the Van Slyke method showed the following distribution of the N (in % of the total N): amide N 8.67; humin N absorbed by magnesia 4.22; humin N insol. in AmOH 0.19; humin N sol. in AmOH 0.52; arginine N 21.38; histidine N 5.42; lysine N 6.11; cystine N 1.01; amino N of filtrate 47.87; non-amino N of filtrate 5.32. The Hopkins-Cole reagent also showed the presence of tryptophan. The free amino N of the protein is 3.13% or about 0.5 the lysine N. The distribution of N of the whole seed in the various ppts. from the alk. ext. is as follows: protein 61.30; alc. ppt. 0.82; Pb(OAc)₂ ppt. 6.72; phosphotungstic acid ppt. 9.01; filtrate from bases 10.45; N in residue (unextractable) 9.10; N in Ba ppts. (by difference) 2.60; detns. by the Van Slyke method, after 24 hrs. hydrolysis with 20% HCl, showed that while the amts. of N found in the various fractions of the whole seed and the seed protein did not differ greatly in some cases there is clearly a difference in the quantity if not quality of the N groups in the protein sepd. from that in the filtrate.

CHAS. A. ROULLER

The fixation of free nitrogen by green plants. F. B. WANN. *Am. J. Botany* 8, 1-28(1921).—See C. A. 14, 1358.

J. J. SKINNER

Variations in the osmotic concentrations of the guard cells during the opening and closing of stomata. R. G. WIGGANS. *Am. J. Botany* 8, 30-41(1921).—There is shown to be a difference between the osmotic concn. of the guard cells of the stomata and that of the other epidermal cells when the stomata are open. The osmotic concn. in the guard cells increases in the forenoon and decreases in the afternoon, and approaches the osmotic concn. of the epidermal cells at night. There is very little change in the osmotic concn. of the epidermal cells during the day. J. J. SKINNER

Influence of temperature on the relations between nutrient salt proportions and the early growth of wheat. W. F. GERICKE. *Am. J. Botany* 8, 59-62(1921).—The germination and early seedling phase of wheat as influenced by different temps. was studied. Solns. prepd. according to the triangle diagram were used and the salts employed were the 9 possible combinations of the following 6 chemical units: K, Ca, Mg, NO₃, H₂PO₄ and SO₄ at the temps. 28° and 17°. There is a marked difference between the sets of salt preps. that proved good with 28° on the one hand and those that proved good with 17° on the other. For best results, it is indicated that the proportion of K salts should be high for the low temp. and low for the high temp. J. J. SKINNER

Suggestions with respect to the measurement of osmotic pressure. L. KNUDSON AND S. GINSBURG. *Am. J. Botany* 8, 164-70(1921).—A piston cylinder is described for use in expression of cell sap. Expts. show that a pressure of 50,000 lbs. yields a more concd. sap than a pressure of 10,000 lbs. No great difference was found in the concn. of the sap expressed from leaves frozen with liquid air or with an ice-salt mixt. There was considerable difference between the osmotic pressure as detd. by the plasmolytic and by the cryoscopic methods. J. J. SKINNER

Studies on the root nodule organism of the leguminous plants. N. V. JOSHI. *Mem. Dept. Agr. India Bact. Ser. 1*, No. 9, 247-76(1920).—Root nodule organism was found to exert a beneficial influence on graminaceous as well as leguminous plants. From the point of view of N fixation and stimulation there was found but one single species of the legume nodule organism. Organisms grown in porous cylinder placed in the center of a pot benefited plants grown in the pot, indicating that the sol. products passed through the porous cylinder. Inoculation with *Azotobacter* gives results similar to those obtained with nodule organisms when nodules are not formed. J. J. S

Constitution of lycorine (GORTER) 10.

COHN, T.: *Beiträge zur Biologie der Pflanzen*. Edited by T. ROSEN. Breslau: J. U. Kerns Verlag.

E—NUTRITION

PHILIP B. HAWK

NORMAL

The form of the nitrogen retention after feeding ammonium salts. HANS GRESSLER. *Z. physiol. Chem.* 109, 280-8(1920).—The S output of fasting dogs fed on NH_4 salts is not decreased; therefore, the retention of N is not due to the preservation of body proteins. The N is stored in some other form. H. V. ATKINSON

Nucleic acid metabolism. JULIUS ROTHER. *Z. physiol. Chem.* 110, 245-53(1920).—Guanosine and adenosine were injected intramuscularly into healthy subjects. They were eliminated in the form of uric acid to an amt. varying from 18 to 79%. The increased output of uric acid continues for about 2 days after the injection. H. V. ATKINSON

Sunflower silage digestion experiment with cattle and sheep. R. E. NEIDIG, R. S. SNYDER and C. W. HICKMAN. Idaho Agr. Expt. Sta. *J. Agr. Research* 20, 881-88 (1921); cf. *C. A.* 14, 990.—Expts. on feeding sunflower silage to sheep and cattle are recorded. The solids, crude protein, crude fiber, ether ext., N-free ext. and ash contents of silage, Orts (silage rejected) and feces are tabulated. The wts. of feed and water consumed, feces voided and daily wts. of the animals are also recorded. The analysis of sunflower silage showed that it compared very favorably with corn silage. The digestible nutrients present in sunflowers compare favorably with the digestible nutrients in mature and immature corn. The nutritive ratio is somewhat narrower in sunflower than in either mature or immature corn silage. Sheep utilized slightly more nutrients in sunflower silage than cows did in these expts. When both corn and sunflower can be grown the selection of a silage crop should depend upon comparative tonnage per acre and cost of harvesting. F. C. COOK

The metabolism of sulfur. III. The relation between the cystine content of proteins and their efficiency in the maintenance of nitrogenous equilibrium in dogs. HOWARD B. LEWIS. Univ. Illinois. *J. Biol. Chem.* 42, 289-96(1920).—The relative efficiencies in nutrition of casein, a protein low in cystine content, and of serum albumin, high in cystine content, have been studied in dogs. Serum albumin under condition of a low protein intake is more effective in maintaining nitrogenous equil. than is casein. When casein is supplemented by cystine, however, it is as efficient for the maintenance of nitrogenous equil. as is serum albumin. These expts. furnish additional evidence that cystine is essential for maintenance as well as growth. Cf. Osborne and Mendel, *C. A.* 9, 1497, Johns and Finks, *C. A.* 14, 2364, Geiling, *C. A.* 11, 2486, and Lewis *C. A.* 11, 2924. I. GREENWALD

Antiscorbutic potency of milk powders. E. B. HART, H. STEENBOCK and N. R. ELLIS. Univ. Wisc. *J. Biol. Chem.* 46, 309-18(1921).—Milk dried by the Merrell-Soule spray process or by another spray process in which the milk is not condensed before being dried and in which the powder is cooled and removed a few seconds after being dried did not protect guinea pigs against the onset of scurvy. Milk dried by the Just (roller) process was effective, whether produced during the summer or winter. A sample of winter-produced dried skimmed milk was ineffective. It is not known if this was due to deficiencies in the diet of the cows from which this milk was obtained or to the absence of the fat permitting a greater destruction of antiscorbutic substance than would otherwise occur. Cf. *C. A.* 13, 1724; 14, 3102. I. GREENWALD

Some observations on the stability of the antiscorbutic vitamins and its behavior to various treatments. N. R. ELLIS, H. STEENBOCK and E. B. HART. Univ. Wisc. *J. Biol. Chem.* 46, 367-80(1921).—Cabbage dried in CO_2 at 65° for 35 hrs., prepd. as sauerkraut, and corn silage were all ineffective as antiscorbutics. Orange juice retained its antiscorbutic action after extrn. with Et_2O , aeration for 2 hrs. or treatment with H_2 .

Part of the activity was removed by shaking with blood charcoal or by passing through a Chamberlain filter. It was completely destroyed by 0.5 vol. H_2O_2 or by slight excess $KMnO_4$ in 1 hr.

I. GREENWALD

Growth and reproduction upon simplified food supply. H. C. SHERMAN, M. E. ROUSE, B. ALLEN and E. WOODS. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 9-10(1919).—Rats were fed rations of white bread (made without milk or butter), either alone or with only 1 other article of food. Later, ground whole wheat was substituted for white bread in several cases. When animals were placed upon the rations at the time of weaning, bread alone resulted in cessation of growth at once and death after 6 weeks; with bread and meat there was some growth at first, but the survival period was only slightly longer than with bread alone; bread and apple produced no growth, but resulted in a longer survival period; bread and turnip produced continuous slow growth; bread and milk gave continuous growth at a normal rate. On this ration, in which the milk furnished one-fifth of the total calories, young rats of both sexes made normal growth and the males were capable of normal reproduction, but the females usually failed to breed and none of them raised any young. When whole wheat replaced the white bread in this ration, young were suckled (at the cost of considerable loss of wt. by the mother), and grew at somewhat less than the av. rate. When about $\frac{1}{4}$ of the total calories were supplied by milk, and the rest by whole wheat, the mother suckled the young without undue loss of wt. and the young made a fully normal rate of growth. When market milk was replaced by dried milk, or when it was used as an ingredient in the breadmaking, and, therefore, heated in the baking process, there was no evidence of any serious destruction of either "fat-soluble A" or "water-soluble B."

V. C. MYERS

The suitability of the "Bachman Test" for water-soluble B. W. H. EDDY and HELEN C. STEVENSON. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 52-6(1919).—This test consists in planting yeast cells in Nageli's soln. in fermentation tubes and incubating the tubes to obtain gas formation. To these tubes are added vitamin "B" exts. from various sources; Bachman's results show that in the absence of such exts. gas formation takes place either not at all or very slowly. E. and S. confirmed these results. "B" vitamin exts. from navy bean, farina, alfalfa, protozoa food mixts., protein-free milk, whole milk, milk contg. small amts. of NaOH, and breast milk were found to stimulate gas production to different degrees. The tables suggest that by further standardization the test may be made efficient in the detection and detn. of vitamin.

V. C. MYERS

The influence of hunger and temperature upon the utilization of food substances. E. UHLENHUTH. Rockefeller Inst. Med. Research. *Proc. Soc. Exptl. Biol. Med.* 17, 108-9(1920).—Metamorphosis of the larvae of amphibians into adult animals takes place when the thyroid glands begin to excrete the thyroid hormone. This change depends also on a 2nd substance, the quantity of which increases in the same ratio as growth; it must be present in a certain quantity for metamorphosis to take place. When the same kind of food is available to the organism, this substance is elaborated, at the same rate of growth, the more easily the less food there is available, and the less readily the more the temp. is lowered.

V. C. MYERS

Some human digestion experiments on raw white of egg. MARY S. ROSE and GRACE MACLEOD. Teachers Col., Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 119-20(1920).—Expts. to det. the relative digestibility of raw and cooked white of egg were carried out with 4 young women in 2 periods of 5 days each. As all had about the same food requirements, they took the same diet, which consisted of rice, cream, saltines, butter, olive oil, fruit juice and lettuce, and raw egg whites for one period, cooked whites for the other. The egg whites furnished 48 g. of protein per capita per day out of a total of 67 g. The cooked eggs were never prepd. in a manner which

would toughen them; the raw whites were taken unbeaten by 1 person, all beaten light by another, and about half and half by the other 2. The coeffs. of digestibility for the cooked egg white protein were from 82 to 86%; for the unbeaten raw whites, 71%; for the beaten raw whites, 83%; for the raw whites $\frac{1}{4}$ beaten, 81%; thus the raw white was as well digested as the cooked if beaten light, and the difference between the 2 was not striking when taken half beaten; about 11% lower coeff. was noted when the whites were not beaten.

V. C. MYERS

A study of the sugar and oxygen relationships in the blood of dogs during exercise. E. L. SCOTT AND A. B. HASTINGS. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 120-2(1920); cf. *C. A.* 15, 385.—Samples of blood amounting to about 1% of the body wt. were drawn from the external jugular vein of dogs. The blood sugar was detd. by the MacLean method, the O by the Van Slyke technic, and the vol. of the corpuscles by a precision hematocrit every 2 hrs. during the 6-hr. periods of work or rest. During the working periods the dogs ran on a horizontal treadmill at the rate of about 5 miles per hr. From the table, which represents 13 expts. on 5 dogs, it is seen that the O content of the blood rises during the 1st 2 hrs. of work as compared with the 1st 2 hrs. of rest and falls slightly thereafter. The O capacity of the blood rises progressively, but at a decreasing rate, throughout the period of work. This is correlated with a parallel rise in corpuscular vol. The concn. of sugar falls steadily throughout the work period. The variations during the 1st 2 hrs. in work and in rest are almost identical but from this point on there is a divergence which becomes pronounced in the later stages; this may indicate that the day's work falls into at least 2 phases; 1st, one in which effects of exercise apparently predominate; 2nd, one in which fatigue effects are relatively more prominent.

V. C. MYERS

Vitamines and the food supply. A. HARDEN. *J. Soc. Chem. Ind.* 40, 79-82R (1921).—A general discussion of vitamins. The subject is considered under the following headings: Vitamine requirements, variation in the vitamic content of food-stuffs (due to season, age, etc.), and the influence of the process of manuf., the latter including, as sub-heads, the effects of the milling of grain, desiccation, preservation, heat and extrn. and refinement (of oils and fats). A table is given showing the effects of vitamine deficiency on animals, the chief sources of vitamins in foods and the food-stuffs which contain small quantities of, or completely lack vitamins.

CHAS. H. RICHARDSON

Effect of yeast on the utilization of food by white mice. R. R. RENSHAW. Harvard Univ. *Am. Naturalist* 45, 73-8(1921).—The plan of these expts. was "to feed a number of animals on a basal diet plus such an amt. of vitamine-containing material as to keep the animal in wt. equil. over a period of time. The amt. of vitamine would vary with the individual, and would need to be detd. in each case. When the animals had been maintained in wt. equil. over a number of days and the food consumption noted, they could then be fed the same daily ration of a diet containing the same number of calories and having the same compn. with the exception of a larger vitamine content, and the wts. of the animals noted." The diets prepd. were: (A) casein 17.5%, starch 49.5, lard 18, butter 9, salts 5, yeast 1; (B) casein 16.5%, starch 48.5, lard 18, butter 9, salts 5, yeast 3; (C) casein 15.5%, starch 47.5, lard 18, butter 9, salts 5, yeast 5. Of 16 mice started in the expts. the records of 12 are tabulated. On diet (A) in unlimited amt. the net loss of the animals in 13 days was 2.93 g. They were then fed diets (B) or (C) in limited amts. when the net gain was 14.38 g. in 16 days. From the experience gained by this test several suggestions are given of details to be observed to insure greater accuracy in repeating such an expt.

L. W. RIGGS

Antiscorbutic action of raw potato crushed and intact. N. BEZSSONOFF. *Bull. soc. hyg.* 8, 622-37(1921); *Compt. rend.* 172, 92-4(1921).—Expts. on guinea pigs proved that intact raw potato had a pronounced antiscorbutic action equal to

that of cabbage or dandelion. The marc of potatoes crushed and pressed in a hydraulic press and fed in amts. equal to that of the intact potato had a very slight antiscorbutic action. The juice was antiscorbutic but less so than an equiv. amt. of intact potato. The juice added to the marc appeared to reinforce but slightly the antiscorbutic action of the latter. In each expt. the animals received oat water in addition to potato.

L. W. RIGGS

Experimental studies in diabetes. Series II. The internal pancreatic function in relation to body mass and metabolism. III. The effects of exercise. FREDERICK M. ALLEN AND MARY B. WISHART. *Am. J. Med. Sci.* 161, 165-92 (1921); cf. *C. A.* 15, 883.—The influence of exercise on carbohydrate assimilation was traced from the normal through various stages of pancreatic impairment in dogs. A rise of plasma sugar, presenting increased transportation accompanies exercise in the normal animal, and the assimilation for test doses of glucose is increased. In mild diabetes, when there is a tendency to abnormal hyperglucemia from defective assimilation of carbohydrate, exercise markedly diminishes the hyperglucemia and glucosuria and facilitates utilization. This power of exercise to improve assimilation applies to the glucose formed from protein diets or body stores as well as from preformed carbohydrate. It does not depend upon the febrile temps. which attend heavy exercise in dogs, for equal results were obtained in human patients without important elevations of temp. It is not lost with long usage but becomes less as the diabetes becomes more severe. At a certain advanced stage exercise is unable to modify hyperglucemia or glucosuria. In extreme forms of diabetes in partially depancreatized animals and in totally depancreatized animals, the extra mobilization of sugar by exercise results in an actual increase of glucosuria and of the D:N ratio. These results indicate: (a) That the increased metabolism of exercise does not impose an added strain upon the internal pancreatic function; (b) that the combustion of food materials through the increased muscular metabolism and mass resulting from exercise is a definite relief to the internal pancreatic function as compared with the accumulation of such materials through inactivity; (c) that the internal pancreatic secretion is an indispensable intermediary in such combustion, and that exercise merely enables the muscles to make more active use of such quantity of this available secretion but cannot compensate when this quantity falls below the necessary minimum. For practical treatment the combustion of food by exercise is preferable to its deposit in the body, but exercise cannot replace dietary restriction nor permanently atone for excessive diets. The value of exercise is as a form of undernutrition. The combustion of cal. by exercise is not as beneficial as the omission of them and loses its potency at a stage when dietetic undernutrition is still effective. Impairment of sugar utilization by exercise occurs only in the extreme stages of diabetes, but in human patients the nervous and systematic influences must also be considered. With any important degree of undernutrition heavy exercise involves undesirable fatigue and strain, but light exercise aids health. Rest is necessary in the severest cases. In the clinical application dependence for the control of the diabetes is placed upon diet, and exercise is limited to the requirements of comfort and hygiene. The thorough dietetic treatment thus brings about changes from former practice: heavy exercise as advocated by the earlier clinicians is discouraged; the hygienic benefits of lighter exercise are made available to many patients to whom exercise was formerly forbidden. **IV. Pancreatic cachexia.** FREDERICK M. ALLEN. *Ibid* 350-64.—Some examples are given of diabetic asthenia and diabetic gangrene in animals, which add to the resemblance between clinical and exptl. diabetes asthenia and are considered gangrene as due to the specific endocrine deficiency. Examples are given in which the diabetes of dogs and cats was replaced by a fatal cachexia of unknown nature. Malnutrition due to impaired digestion or intestinal absorption was one factor, but the results differ in some respects from simple undernutrition, and may be related to the

metabolic alterations in states of prostration which suppress glucosuria even after total pancreatectomy. It is important to distinguish the mere suppression of glucosuria by some injury, poison or cachexia from genuine control or improvement of the diabetes. It is thus impossible to use totally depancreatized dogs for any therapeutic expt. unless for testing some agency to replace the internal pancreatic function. The results of the undernutrition treatment of animals and patients are distinguished from mere cachectic suppression of glucosuria by the fact that the power of food assimilation is demonstrably strengthened, the general health improved and life lengthened.

H. V. ATKINSON

The metabolism of the eunuch. BERNARD E. READ. Pekin Union Med. College. *J. Biol. Chem.* 46, 281-3(1921).—The urine of 6 eunuchs was examined. Creatine was found in all but one, who had not been operated upon until the age of 29 yrs. All the others had been operated upon earlier. One urine contained only a trace of creatinine and 0.007% creatine.

I. GREENWALD

Certain dietary factors to be considered in the treatment of cases of hyperthyroidism. J. ROSENBLUM. Pittsburgh. *Proc. Soc. Exptl. Biol. Med.* 17, 28(1919).—R. has obtained clinical evidence that the diet for patients suffering from hyperthyroidism should contain the min. amt. of protein, and that foods low in I content should be selected.

V. C. MYERS

A case of lipuria associated with chronic nephritis. L. BAUMAN AND G. H. HANSMANN. State Univ. of Iowa. *Proc. Soc. Exptl. Biol. Med.* 17, 115(1920).—Clinical, pathological, and chem. data were collected on a case of lipuria associated with nephritis which terminated in uremia. The lipuria was influenced by the amt. of fat in the diet. The absence of coagulated protein, the scarcity or absence of cells in the urine and the apparent absence of a fistulous communication between the urinary passages and the lymphatics at autopsy indicate that the lipuria was due to an altered permeability of the renal cells. The available evidence makes it probable that there are at least 2 types of lipuria, the one associated with a fistulous communication, the other entirely due to an abnormal condition of the kidney cells.

V. C. MYERS

Sodium citrate and scurvy. H. K. FABER. Stanford Med. Sc., San Francisco. *Proc. Soc. Exptl. Biol. Med.* 17, 140-1(1920).—An Italian child 10 mos. old was suffering from severe scurvy; the child had been fed from birth on raw certified milk to which had been added sodium citrate in the proportion of 1 gr. to each oz. of modified milk. A series of 17 guinea pigs was fed on oats and milk for 10-46 days. For 9 of these 0.25 to 2.0% of sodium citrate was added to the milk. The av. milk intake per day for the sodium citrate animals was 41.6 cc., and 39.1 cc. for the control animals. Eight of the 9 animals fed sodium citrate (or 88.9%) developed scurvy, and 2 in the control series (or 25%) developed scurvy. About 32 cc. per day of this milk seems to be the lower limit of amts. of milk necessary to prevent scurvy. The citrate was shown to make the milk slightly more alk. as measured by electrometric detns. of H ion.

V. C. MYERS

Ophthalmia and diet. THOMAS B. OSBORNE AND LAPAVETTE B. MENDEL. *J. Am. Med. Assoc.* 76, 905-8(1921).—Expts. made by feeding 136 rats with diets deficient in fat-sol. vitamin resulted in 69 showing symptoms of eye disease. Of 225 rats fed diets deficient in water-sol. B, 90 fed diets otherwise deficient, 201 on exptl. diets presumably adequate, and 348 stock animals on mixed diet, none of the 864 animals showed symptoms of eye disease. The ophthalmia was not cured by the usual procedures of local antiseptics, but a restoration of fat-sol. A to the diet almost invariably produced a disappearance of the eye disorder, even though the animal subsequently died. Ophthalmia associated with a dietary deficiency in fat-soluble vitamin A. ISABEL M. WASON. *Ibid* 908-12.—Eleven of the exptl. animals of Osborne and Mendel were subjected to histologic and bacteriologic study with the following conclusions: The pri-

mary etiologic factor was the absence of fat-sol. vitamine A. The mechanism by which corneas are rendered susceptible to bacterial invasion is unknown. The type and virulence of the organisms of secondary infection det. in part at least the course of the disease. The anatomic manifestations of the disease are characterized by hyalinization or necrosis of the outer layer of corneal epithelium, exudation of serum and cells into epithelium and stroma, and a proliferation of the blood vessels and fibro-plasts. In advanced cases invasion of the anterior, and occasionally posterior chamber, results. The degree to which restoration is possible depends on the extent of the secondary injury.

L. W. RIGGS

CATHCART, E. P.: *The Physiology of Protein Metabolism*. Monographs on Biochemistry, edited by R. H. A. Plimmer and F. G. Hopkins. New Ed. London: Longmans, Green & Co. 176 pp. 12s. 6d.

F—PHYSIOLOGY

ANDREW HUNTER

Monoamino acids in lens of eyes. A. JESS. *Z. physiol. Chem.* 110, 266-76(1920).—Three proteins were sepd. from the lens (3,000 lens used): an albumoid, α -crystallin, and β -crystallin, with a respective content in N of 16.34, 16.46, and 17.0%; 9 amino-acids were isolated and their relative proportions in the 3 above proteins were detd. In *cataract* there is an increase in the amt. of the albuminoid and a corresponding diminution in both crystallins. The crystallins are rich in alanine and valine. Glycocol is absent from all 3 proteins.

H. V. ATKINSON

Studies on renal threshold for glucose. KING GOTO AND NOBUZO KUNO. Tokyo Imp. Univ. *Arch. Internal Med.* 27, 224-37(1921).—Plasma sugar was detd. by the Myers-Bailey modification of the Lewis-Benedict method (*C. A.* 10, 1047). The urine was tested for glucose with Nylander's soln. and with Benedict's (*C. A.* 3, 2171). If present by these tests, the amt. was detd. by the method of Benedict and Osterberg (*C. A.* 12, 1304). The blood was obtained after a night's fast. The plasma sugar in 53 individuals varied between 0.066 and 0.166%, av. 0.092%. Of the total, 42 fell between 0.08 and 0.11%. Each subject received 100 g. glucose and the concn. of glucose in the plasma and urine was followed. In all but 5, the plasma sugar concn. reached its max. between 40 and 60 min. and returned to normal 3 hrs. after the administration of the glucose. In 20 cases no demonstrable amts. of glucose appeared in the urine. The fasting plasma sugar in these averaged 0.092%; the max. after glucose fell between 0.114 and 0.185% (mostly below 0.16%), av. 0.142%. The 28 cases with small amts. of glucose in the urine showed a fasting plasma sugar of 0.093%, rising to a max. between 0.128 and 0.196%, mostly between 0.140 and 0.190%, and averaging 0.160%. In the 5 cases in which the return to normal concn. was delayed, the max. was about 0.20%. These cases also showed rather larger amts. of sugar in the urine but no other signs of diabetes. Glucose appeared in the urine of 8 subjects with rather low levels of plasma sugar—0.13 to 0.16%. The renal function for H_2O , NaCl and urea in these cases was normal.

I. GREENWALD

Variations of acid concentration in different portions of the gastric chyme and its relation to clinical methods of analysis. FRANK D. GORHAM. Wash. Univ., St. Louis. *Arch. Internal Med.* 27, 434-40(1921).—Aspiration of gastric contents in rapidly repeated small vols. showed great variation in the acidity of the different portions. It is concluded that the gastric contents after a meal do not form a homogenous mixt. This lack of homogeneity explains the variety of curves obtained by the "fractional" method. For accurate work the entire contents must be aspirated at a definite interval after the meal.

I. GREENWALD

The carbon dioxide absorption curve and carbon dioxide tension of the blood of normal resting individuals. JOHN P. PETERS, JR., DAVID P. BARR AND FRANCES D.

RULES. Russell Sage Inst. and Bellevue Hosp., New York. *J. Biol. Chem.* **45**, 489-536 (1921).—A study of the CO_2 absorption and tension in the blood of 3 normal individuals. The absorption curves differed in height and to a smaller extent in pitch but were quite characteristic of the individual and remained unaltered over a period of 3 months. All 3 curves fell within the limits reported by previous observers. At 40 mm. CO_2 and at 37.5° , the extremes were 43 and 56 vol. % CO_2 , av. 49 vol. %. In order to correct the curve as detd. for the effect of O_2 unsatn. and thus obtain the curve for the circulating blood, a correction, D , is added to the observed values for CO_2 capacity at the different tensions. This correction is obtained from the equation $K \times Hb = D$, in which Hb = the O_2 unsatn. in vol. % O_2 and K , as calcd. from the data of Christiansen, Douglas and Haldane (*C. A.* **8**, 3588) and of Joffe and Poulton (*J. Physiol.* **54**, 129) has a value of 0.34 between 30 and 70 mm. CO_2 . The CO_2 tension of the arterial and venous blood is taken from the corrected curve at a capacity equal to that of the circulating content of the circulating blood. The H^+ concn. was calcd. from the $\text{H}_2\text{CO}_3:\text{BHCO}_3$ ratio. The alveolar CO_2 tension was detd. by method of Haldane and Priestly. When equilibrated with an air- CO_2 mixt. of same tension as subjects alveolar air, the H^+ concn. of blood varied, in different individuals, between $10^{-7.12}$ and $10^{-7.29}$. The arterial CO_2 tension, as calcd., is not the same as the alveolar CO_2 tension but may be 10 or 11 mm. higher. The H^+ concn. of the arterial blood of different individuals varied between $10^{-7.12}$ and $10^{-7.46}$ but was const. and characteristic for any one individual. The CO_2 tensions calcd. for the blood from arm veins were higher than the values calcd. from rebreathing methods. The difference between arterial and venous tension varied between 0.8 and 10 mm., av. 6 mm. The H^+ concn. of arterial and venous blood is practically identical. Observations on a patient with polycythemia and on one with chronic nephritis and hypertension gave similar results.

I. GREENWALD

Blood sugar regulation and the origin of the hyperglucemias. I. Glycogen formation and glycogenolysis. EINAR LANGFELDT. Univ. Christiania, Norway. *J. Biol. Chem.* **46**, 381-400 (1921). II. Condition of action of liver diastases. *Ibid* 391-402. III. Theory. *Ibid* 403-9.—II contains the exptl. part. I is a review of the literature and III a discussion of the significance of results reported in II. A calf liver was washed through the portal vein with H_2O , the larger parts of the connective tissue were dissected out and the remainder of the liver tissue was hashed and dried on glass plates in a current of air. This was ground to a powder, extd. with 5 vols. PhMe and then with 3 vols. EtOH. The air-dried powder was extd. for 5 days at 37° with 10 times its wt. of 50% glycerol in $\text{CHCl}_3\text{-H}_2\text{O}$, then centrifuged and kept in a brown bottle. It had no action upon glycogen in H_2O . A series of mixts. was prepd., each containing 5 cc. 1.5% glycogen, 5 cc. of one of Sørensen's phosphate solns. (*C. A.* **3**, 1283; **4**, 607), 0.5 cc. of the liver ext. and $\text{CHCl}_3\text{-H}_2\text{O}$ to 25 cc. After 4, 19 and 48 hrs. at 37° glucose was detd. by the method of Hagedorn and Jensen (cf. Höst and Hatlehol, *C. A.* **14**, 3252). The optimum glucose formation was at H-ion concn. $10^{-4.2}$. At the reaction of blood, the hydrolysis was inconsiderable. In the next series of expts. 1 cc. 15% NaCl was added to each flask before diln. to 25 cc. The curve of diastatic activity shows two maxima, one at $10^{-4.3}$ due to the NaCl, the other, less marked, at $10^{-4.1}$, due to the phosphate. The addition of adrenaline to mixts. made up as in the first series in amts. to make the final concns. 1:125,000, 1:500,000, and 1:5,000,000 was studied at H-ion concns. between $10^{-6.64}$ and $10^{-8.04}$. With the lowest concn. of adrenaline, the max. hydrolysis was at the acid end and was no greater than without the adrenaline. In the second series (1:500,000) hydrolysis was about equally great from H-ion concn. $10^{-6.64}$ to $10^{-7.16}$ and was as great in all as in max. in first series. The highest concn. of adrenaline gave slightly greater hydrolysis, the same from $10^{-6.64}$ to $10^{-6.97}$, then falling slightly, then rising to a slightly greater max. at $10^{-7.12}$, then falling again.

Using thyriodine tablets (containing NaCl) in amts. equiv. to 1:15,000 and 1:50,000 of the fresh gland, the optimum reaction was found to be the same as in the NaCl expts. Exts. of anterior and of posterior lobe of hypophysis had no effect on the hydrolysis. The combination of adrenaline 1:500,000 and thyriodine 1:50,000 increased hydrolysis markedly with the max. at the alk. end of the series. Similar results were obtained with mixts. containing 0.6% NaCl, adrenaline 1:5,000,000 and thyriodine 1:50,000.

I. GREENWALD

Blood as a physicochemical system. L. J. HENDERSON. Harvard College. *J. Biol. Chem.* 46, 411-9(1921).—From the data in the literature (Henderson, *C. A.* 2, 1299; 4, 1493, 1990; 14, 3710; Christiansen, Douglas and Haldane, 8, 3588; Barcroft, *C. A.* 8, 1969; Hasselbalch and Warburg, *C. A.* 12, 2360) and some unpublished observations on serum Cl^- , H. has constructed a two-dimensional nomogram illustrating the relations between the free and combined O_2 of the blood, and the free and combined CO_2 , H-ion concn. and Cl^- content of the serum in defibrinated blood. "The relationship between the six variables is such that, for a given blood, when values are assigned to any two, the values of the other 4 are detd. and the condition of equilibrium unequivocally defined."

I. GREENWALD

Blood gas analysis. VII. The influence of boron, aluminium and lanthanum on hemoglobin and the cells. H. STRAUB AND KLOTHILDE MEIER. *Biochem. Z.* 111, 45-66(1920); cf. *C. A.* 15, 385.—In continuing the previous studies, it is shown that there is fundamentally a similarity of action of the 3 elements B, Al and La of the third series in the periodic system on hemoglobin. The optimum p_{H} for the jogs in the CO_2 -capacity curve was about 7.31 for each of them at the lower concns., while with increasing concn. the antagonistic effect was at its optimum at a p_{H} = 6.90. The action of the 3 elements on the blood cells could not be completely tested because of hemolysis, but apparently the action is of the same order as on hemoglobin. **VIII.** Influence of digitalis compounds on the permeability of human erythrocytes to ions. *Ibid* 67-82.—A report is made of a study of the CO_2 -combining capacity of blood-corpusele suspensions in physiol. saline soln. in the presence of various concns. of strophanthin, verodigen and digitofol. When the higher acidities are reached the erythrocytes in such solns. become permeable to anions earlier than do similar cells in normal saline soln. alone. This action is antagonistic to that of K ions. The pharmacological theory that digitalis activity is related to Ca action is accordingly confirmed.

F. S. HAMMETT

Secondary sexual characteristics and endocrinology. A. PÉZARD. *Endocrinology* 4, 527-40(1920).—The endocrine function of the testicle is indispensable to the maintenance of the conditioned characters. Its morphogenic action presents in addition a remarkable constancy which is dissembled by the arrest of growth in the adult. When as little as one thirtieth of testicular tissue is present secondary sexual characteristics still develop. This is called the Law of Minimum Efficacy. The effect of the testicle follows an All-or-none Law; as soon as the functional threshold value is passed, whatever may be the mass of the active gland, a cock takes on as a whole its secondary sexual characteristics. When such animals are put on an exclusive meat diet changes occur that are secondarily consecutive to castration; therefore the reproductive glands are capable of responding to a definitive chem. influence, even though the response is not such as to produce a new race.

F. S. HAMMETT

Origin and evolution of the interstitial cells and of the ovary and the significance of the different internal secretions of the ovary. I. OCHOTERENA AND E. RAMÍREZ. *Endocrinology* 4, 541-6(1920).—Of the 2 endocrine functions of the ovary, the corpus luteum mediates that having to do with the formation of the decidual cells and the modifications of the uterine mucosa which favor nidation of the ovum. If fecundation occurs the structure is transformed to the corpus luteum of pregnancy and alters the nature of its secretion. It assumes relations with the mammary glands and other

glands of internal secretion. The secretion of the corpus luteum is antagonistic to that of the interstitial ovarian cells; when the corpus luteum retrogresses or is suppressed the action of the interstitial secretion is manifested. This secretion is the detg. factor in menstruation.

F. S. HAMMETT

The internal secretion of the testis. ALDO C. MASSAGLIA. *Endocrinology* 4, 547-66(1920).—Using the rooster as the exptl. animal and performing the expts. of ligation of the ducts and transplantations, M. detd. that the testicle has an internal secretion which gives to the male the masculine sexual characters and sexual instinct and keeps the function of the hypophysis normal. It appears that the Leydig's cells are the effective tissue.

F. S. HAMMETT

Protein nitrogen and residual nitrogen in the blood serum of various animals (vertebrates and invertebrates). G. QUAGLIARIELLO. *Atti accad. Lincei* 29, II, 213-8(1920).—Q.'s investigations show that, whereas the proportion of N in the blood of animals of different types varies in the ratio 1:1700, the proportion of residual N varies only from 1 to 30, or, if reptiles and birds are included, from 1 to 100. This relative constancy of the proportion of residual N in the blood of all animals, of whatever class, when considered in relation to the wide variation of the protein content, shows that the fundamental function of the blood consists in the transportation to and from the tissues of the anabolic and catabolic materials (amino acids, carbamide, NH_4 , etc.). Only when the organization becomes more perfect and the blood assumes other functions does enrichment of the blood in colloidal substances proceed *pari passu* with development of the cardiovascular app.

J. C. S.

The influence of glands with internal secretions on the respiratory exchange. I. Effect of the subcutaneous injection of adrenaline on normal and thyroidectomized rabbits. D. MARINE and C. H. LENHART. Western Reserve Univ. *Am. J. Physiol.* 54, 248-60(1920).—Adrenaline causes a rise in O_2 consumption both in normal and thyroidectomized rabbits. The abs. rise may be greater in normal animals, but the percent rise may not be altered. Evidence is advanced that in rabbits, as in other animals, the decrease in the metabolic rate following thyroidectomy is gradual and requires several days for its demonstration.

J. F. LYMAN

The total carbonate content of the arterial and venous plasma in normal individuals. R. W. SCORR. Western Reserve Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 18-19(1919).—The bloods of 19 normal individuals at rest have been examd. Samples of arterial and venous blood were obtained within a few minutes of each other, and were delivered under albolene into paraffin-coated centrifuge tubes and immediately centrifuged. One cc. of the plasma was used to det. the total CO_2 content by Van Slyke's method. This was considered more advantageous than the detn. of the CO_2 -combining power. The total CO_2 content of arterial plasma is a fairly const. figure, averaging 56 vol. %. The CO_2 content of venous plasma is from 3 to 8 vol. % higher than that of arterial plasma. This difference increases if the individual takes light exercise just before the blood samples are taken; under these conditions, the arterial figures remain about normal, while the venous are from 12 to 15 vols. higher.

V. C. MYERS

Method and results of a study of the distribution of iodine between cells and colloid of thyroid glands. A. L. TARUM. Univ. of Chicago. *Proc. Soc. Exptl. Biol. Med.* 17, 28(1919); cf. *C. A.* 14, 2946.—The colloid of the thyroid gland in frozen sections completely disappears out of the acini when sections are floated in physiol. salt soln. The sections were washed in a second salt soln., dried at 105° , weighed and analyzed for I by Kendall's method. The I in the colloid portion was detd. either by evapn. of the salt soln. containing the colloid, or differentially by analysis of the whole dried gland. In about 80 expts. on dog thyroids, the I was found in most instances wholly in the colloid, as the cell portion was free from I. In a smaller % of cases the cell mass gave only qual. tests for I, which might be due to unopened small acini.

V. C. MYERS

The excretion of urea. J. H. AUSTIN, E. STILLMAN AND D. D. VAN SLYKE. Hosp. Rockefeller Inst. Med. Research. *Proc. Soc. Exptl. Biol. Med.* 17, 59-60(1919).—The excretion rate of urea in normal men increases directly as the blood urea concn., and as the square root of the vol. of urine, if the latter is less than 5 l. per day. These relations are expressed in the formula, $D = KB \sqrt{V}$, in which $D =$ g. of urea excreted per 24 hrs., $B =$ g. of urea per l. of blood, $V =$ l. of urine per 24 hrs. When the size of the individual ($W =$ wt. in kg.) is introduced the formula become $D/W = KB \sqrt{V/W}$, or $K = D/B \sqrt{VWK} = 7.5 \approx 8$ for normal persons. K is lower in value when the urea-excreting function is deficient. This formula gives more consistent results than that of Ambard.

V. C. MYERS

Comparison of the catalase content of the tissues of the mother and of the offspring. W. E. BURGE. Univ. of Illinois. *Proc. Soc. Exptl. Biol. Med.* 17, 129-31(1920).—The catalase content of the tissues of newly born puppies was found to be lower than that of the mother; the tissues of puppies that were 10 wks. old were found richer in catalase than those of the mother. The low metabolism or oxidation in the newly born is attributed to the low catalase content of the tissues, while the high metabolism in youth is attributed to the richness of the tissues in catalase brought about by a large output of this enzyme from the liver. Likewise, the increase in oxidation in the sprouting of grain or of potatoes is attributed to an increase in catalase. The increase in metabolism and hence the development of the fertilized egg is attributed to the increase in catalase brought about by the stimulation of the egg by the spermatozoön to an acceleration in the formation of this enzyme.

V. C. MYERS

The equilibrium between hemolytic sensitizer and red blood cells in relation to the hydrogen-ion concentration. CALVIN B. COULTER. Hoagland Lab., Brooklyn, N. Y. *J. Gen. Physiol.* 3, 513-21(1921).—This article which is a continuation of studies previously reported (*C. A.* 15, 1032) indicates that the proportion of the total amt. of hemolytic sensitizer present in a salt-free medium which is combined with the homologous cells reaches its max. (almost 100%) at pH 5.3. On the alk. side of this point the proportion decreases with the alkalinity, reaching a minimum of approx. 5% at pH 10; on the acid side the proportion diminishes with increasing acidity, but less rapidly than with an equal increase in alkalinity. The presence of NaCl in the medium greatly increases the proportion of sensitizer combined with cells at all H-ion concns. except those near pH 5.3; at this point the combination of sensitizer with cells is independent of the presence of NaCl. At constant vol. and a given H-ion concn. and temp. there is an equilibrium between the amt. of free sensitizer and that combined with the cells. The combination of sensitizer and cells is related fundamentally to the isoelec. point of the sensitizer since this is the point of max. combination. The dissociated ions of the sensitizer do not combine with the cells. Combination therefore occurs only between the cells and the undissociated mols. of the sensitizer. CHAS. H. RICHARDSON

Comparative studies on respiration. XV. The effect of bile salts and of saponin upon respiration. MATILDA MOLDENHAUER BROOKS. Harvard Univ. *J. Gen. Physiol.* 3, 527-32(1921); cf. *C. A.* 15, 1037.—At a concn. of 0.000125M Na taurocholate increases the rate of respiration in *Bacillus subtilis*; at 0.001 M and higher concns. the rate is decreased. NaCl is antagonized by Na taurocholate, the effect being most favorably shown in mol. proportions of 14,375 parts NaCl to 1 part Na taurocholate. Saponin solns. of 0.00005 M to 0.001 M decrease the rate of respiration in *B. subtilis* while lower concns. produce no effect. The results obtained with *B. subtilis* resemble those obtained by Osterhout (unpublished data) in respect to elec. conductivity in *Laminaria*, in which the effect of saponin was very much less than that of Na taurocholate. XVI. Effects of hypotonic and hypertonic solutions upon respiration. O. L. IN MAN. *Ibid.* 3, 533-7.—Highly hypertonic solns. of seawater produced a rapid reduction in the rate of respiration of *Laminaria agardhii*; in highly hypotonic solns. the

rate was reduced somewhat less rapidly. Similar results were obtained with *Urea lactuca*. Hypertonic solns. of NaCl, CaCl₂ and mixts. of NaCl and CaCl₂ (50:1) caused a decrease in the rate of respiration of wheat seedlings. CHAS. H. RICHARDSON

Carbohydrate and lactic acid exchange in frog muscle. OTTO MEYERHOF. *Arch. ges. Physiol.* 185, 11-32(1920).—Lactic acid, carbohydrate balance, and O consumption in muscle were compared. Under all conditions of oxidation there was a complete equil. in the lactic acid transformation and the carbohydrate balance, the change in the latter being concerned chiefly with glycogen. If by exhaustion 0.3% of lactic acid was formed in the muscle an equiv. amt. of carbohydrate disappeared. When lactic acid accumulated in the muscle under conditions of rest and anoxobiosis there was a corresponding change in carbohydrate, and here also glycogen was primarily concerned. The O consumption and carbohydrate transformation were essentially equiv. under conditions of tranquil respiration, although when the muscle was fatigued variations appeared. G. H. SMITH

Sex-specific action of germinal gland extracts. ARTHUR WEIL. *Arch. ges. Physiol.* 185, 33-41(1920).—The subcutaneous injection of an ext. of ox testes into sexually immature males, castrates, and pregnant females in amts. corresponding to 30 g. of fresh organ per kg. of body wt. produced definite alterations in the CO₂ curves (Haldane), manifested by a sudden fall and an abrupt rise to normal within 2 hrs. after the injection. Such injections were without action on normal adult males and females. Exts. of ovary were inactive when injected into adult males, but in the other animals caused a slight alteration in the CO₂ curve. Other organ exs. in large amts. caused much the same changes, although no sex-sp. action was apparent. When injected subcutaneously both testicle and ovary exs. call forth typical nervous disturbances as sex-sp. as those induced in the gas metabolism. G. H. SMITH

The arresting action of the liver on exogenous uric acid. CHAUFFARD, P. BRODIN AND GRIGAUT. *Compt. rend.* 172, 477-9(1921).—Expts. were made upon 13 dogs, previously anesthetized with chloralose or morphine, and subjected to fasting or various diets. During digestion blood samples were taken from the portal and hepatic veins and the uric acid in each was detd. according to the technic of Folin and Denis as modified by Grigaut (cf. *Compt. rend. soc. biol.* 1920, 1273). Three fasting dogs, one on a milk and one on a varied diet, showed no arrest of uric acid by the liver. Two dogs fed sweetbreads, 2 fed liver and spleen and 4 on a varied diet showed an arrest of from 23 to 52% of the uric acid of the portal blood. It was notable that the highest figures, 47 and 53%, were obtained on a diet of liver and spleen foods rich in purine compds., also that the animal on a milk diet showed no arrest of uric acid by the liver. It appears that the arrest of uric acid by the liver is *periodic, cyclic, and subordinate* to the food eaten. L. W. RIGGS

Mechanism of urea secretion. JEAN OLIVER. *Med. School Leland Stanford, Jr. Univ. J. Exptl. Med.* 33, 177-86(1921).—Urea is present in the cells of the proximal convoluted tubule in a concn. higher than that of the blood or than that of the cells of any of the other kidney tubules. Such a condition can only be reconciled with an assumption of an active secretion (excretion) on the part of these cells. Urea also passes through the glomerular filter with the other crystalloids of the blood plasma. The final concn. of urea is due to the above-mentioned secretion by the proximal convoluted tubule and to the absorption of water in other parts of the tubule. C. J. WESS

LAIAGNEL-LAVASTINE, M.: *The Internal Secretions and the Nervous System*. New York: Nervous and Mental Disease Publishing Co. 57 pp. For review see *Am. J. Med. Sci.* 161, 599(1921).

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G—PATHOLOGY

H. GIDEON WELLS

Epinephrine hypersensitiveness and its relation to hyperthyroidism. FRANCIS W. PRABODY, *et al.* *Am. J. Med. Sci.* 161, 508-17(1921).—The Gletsch test for the diagnosis of hyperthyroidism was found to be unreliable in a large number of cases.

H. V. ATKINSON

Cholesterol in cerebrospinal fluid. A. LEVINSON, I. L. LANDENBERGER AND KATHARINE M. HOWELL. *Am. J. Med. Sci.* 161, 561-7(1921).—Normal cerebrospinal fluid as well as fluid in which the Wassermann and Lange reactions are positive contains no appreciable amts. of cholesterol. Fluids from hemorrhage of the brain and brain abscess are high in cholesterol. The cholesterol content depends on the permeability of the meninges. A trace of cholesterol is usually found in meningitis and in brain tumor fluids. Normal ventricular fluid contains no cholesterol. The Wassermann reaction does not depend on cholesterol.

H. V. ATKINSON

Cholesterol and lecithin in chylous urine. MINORU SANO. *Tohoku J. Exptl. Med.* 1, 448-59(1920).—Lecithin and both free and combined cholesterol were identified in chylous urine.

H. V. ATKINSON

Anaphylaxis. EMIL ABDERHALDEN AND ARTHUR WEIL. Univ. Halle. *Z. physiol. Chem.* 109, 289-98(1920).—Glycine and polypeptides up to heptaglycylglycine when injected intraperitoneally into pigs produced no anaphylaxis but produced a drop of temp. of about 1°. The injection of hexa- and heptapolypeptides caused a characteristic skin reaction.

H. V. ATKINSON

Changes in the protein content of blood serum caused by narcosis, cancer, pregnancy and X-ray. ALFONS MAHNERT. *Z. physiol. Chem.* 110, 1-28(1920).—The protein content was detd. refractometrically. It is diminished in pregnancy, cancer, and general cachexia, and during narcosis and X-ray exposure.

H. V. ATKINSON

Sensitization and treatment of bronchial asthmatics with pollens. I. C. WALKER. *Am. J. Med. Sci.* 57, 409-26(1919); *Abstracts Bac.* 3, 140.—W. discusses the treatment of bronchial asthma "with pollens, (1) preceding the pollen season and (2) during pollen season; pollens as a possible cause of continuous asthma; the specificity of proteins in the treatment of bronchial asthma in conjunction with multiple sensitization; the association of hay fever with bronchial asthma; and the kind of pollens with their respective seasons that are the cause of bronchial asthma." The method of prepg. the solns. of pollen protein for testing the degree of sensitiveness of the patient is described, also its various dilns. The dosage and procedures employed in treatment are fully outlined. Case reports are presented. He concludes that seasonal bronchial asthma caused by pollens may be prevented in patients by proper treatment (which is outlined) with the pollens to which they are most sensitive. Treatment during the season is less reliable than that preceding the season, but when given, smaller amts. of the pollen protein should be used. A continuation of asthma after the termination of the pollen season is due to secondary bacterial infection in patients whose resistance has been lowered by the severe pollen asthma. W. suggests the use of pollen treatment in continuous asthma when the patient gives positive cutaneous tests to them, to det. if they are a causative

factor. The most common pollens causing seasonal asthma are mentioned, and the seasons of their pollination are given.

E. J. C.

Russell's fuchsin bodies. GUTHRIE MCCONNELL AND ALPHONSE LANG. Cleveland.

J. Med. Research 42, 99-103(1921).—Russell fuchsin bodies are the result of degenerative changes occurring in the cell protoplasm but not in the nucleus. The plasma cell is most commonly affected, but any other variety of tissue cell may undergo a similar degeneration. The red blood cells are not concerned in their production, this conclusion being based upon the fact that in the microscopic examn. no relation could be found to exist among the blood cells, blood pigment and the fuchsin bodies. Again, these bodies are very strongly Gram-positive; red blood cells and their products of disintegration are negative.

E. B. FINK

Studies on the nature of the action of non-specific protein in disease processes.

I. Typhoid protein (dead typhoid bacilli) and soluble toxin. DAVID MURRAY COWIE AND ROCKWELL M. KEMPTON. Ann Arbor. *J. Med. Research* 42, 227-39(1921).—Dead typhoid bacilli, when allowed to remain in contact with diphtheria toxin at 37° for 1 hr., do not form a permanent union with the toxin nor decrease or increase the toxic effect of fatal doses of the toxin when injected together with the toxin, subcutaneously into guinea pigs. Dead typhoid bacilli, under the same conditions, when removed from the toxin, do not adsorb or absorb the toxin sufficiently to affect in any way the action of a fatal dose of toxin with which they were incubated. Injection of dead typhoid bacilli does not protect an animal against a lethal dose of diphtheria toxin. Normal horse serum, injected subcutaneously at the time of a fatal dose of diphtheria toxin, protects the pig perfectly.

E. B. FINK

Post-arsphenamine jaundice. A. T. TODD. London. *Lancet* 1921, I, 632-4.—The investigations include clinical findings and symptoms, urinary examns. including amt., acidity, presence of albumin, casts, sugar, acetone, deposit of leucine and tyrosine, bile pigments and acids, urobilin, % of urea, estn. of NH_3 and the NH_3 -urea N ratio.

E. B. FINK

The treatment of infectious diseases by leucocytolysis produced by röntgenization of the spleen. IVAN I. MANOUKHIN. Petrograd. *Lancet* 1921, I, 685-7.—M. proved by direct expt. that an organism combats infection mainly by means of disintegration of its leucocytes. The leucocytosis in many acute infectious diseases is regarded as preparatory to their breaking-up. The organism can cure itself only when the sp. anti-substances produced by the leucocytes have come out from them and filled the blood plasma, as a result of leucocytolysis. This process is produced in the blood by special sp. enzymes entering it, which it is proposed to call "leucocytolysins." Leucocytosis, in those cases in which it precedes leucocytolysis, is produced by sol. enzymes whose properties are opposed to those of the leucocytolysins, and which are termed "anti-leucocytolysins." Leucocytolysins are produced by the spleen and the anti-enzymes by the liver. The results of röntgenization of the spleen of monkeys and guinea pigs show that leucocytolysis plays an important role in the cure of infectious diseases. Röntgenization of the spleen increases the proportion of alexin and the following sp. antibodies in the blood: hemolysins, agglutinins, bacteriolysins and opsonins. The curve of fluctuation of sp. anti-substances in the blood, revealed by the Bordet-Gengou reaction, corresponded to the curve of fluctuation of leucocytolysins in guinea pigs infected with human tuberculosis. By röntgenization of the spleen of animals used for the production of curative sera, more potent anti-sera were obtained. Röntgenization of the spleen in the treatment of various infection: and particularly of tuberculosis is discussed.

E. B. FINK

The permeability of human blood corpuscles to grape sugar, with studies of non-coagulated blood of hemophiles. MAX BÜRGER. Kiel. *Z. ges. expil. Med.* 12, 161-7 (1921).—A high sugar content was found in the blood cells of 2 hemophiles. With a

const. plasma sugar content the sugar content of the cells varies at different times. In extravasated blood, the sugar content of blood corpuscles decreases with the time of contact of corpuscles with plasma. Coagulation of blood has no influence on the passage of sugar through the corpuscular membrane. The corpuscles in blood which has been prevented from clotting with hirudin regularly contain sugar. In the detn. of the sugar content of corpuscles the continued action of the glucolytic enzymes of the red cells is of importance.

E. B. FINK

Comment on the report of Schenk: "The influence of the intravenous injections of hypertonic solutions." HERMANN FREUND. Heidelberg. *Z. ges. expil. Med.* 12, 226 (1921).—Schenk reported the production of fever and chills by intravenous injection of hypertonic NaCl and sugar solns. F. calls attention to the fact that such solns. do not produce fever in rabbits when injected slowly and when the H₂O used is doubly distd. in glass containers.

E. B. FINK

Basal metabolism in health and disease. ROLLY. *Z. ges. expil. Med.* 12, 146-60 (1921).—A basal metabolism apparatus is described whereby accurate detns. of O₂ and CO₂ may be made, giving respiratory quotients representing the actual conditions obtaining. Figures are recorded for animals and man particularly in diabetes. A small type of instrument is available for infants.

E. B. FINK

Clinical and experimental electropathology. I. KAWAMURA. Vienna. *Z. ges. expil. Med.* 12, 188-94 (1921).—A clinical study of 100 cases of elec. shock including low and high voltage indicated that the effect is mainly on the vascular system, central and peripheral nervous system, the compn. of the urine and upon the gastrointestinal tract. Interference with the action of the heart and vascular injury were observed in 16 cases. In exptl. animals passage of electrical currents, both direct and alternating, produces changes in the coagulability of the blood and the leucocyte count. The action of the elec. current on the animal organism is complex; all organs and all functions are influenced and this varies with the species. The action is probably two-fold. The purely electrical, resulting in transformation of the elec. energy into electrodynamic, electrochem. and other forces; and a second, irritating action.

E. B. FINK

The cardiorespiratory mechanism in health and disease. R. G. PEARCE. Lakeside Hosp., Cleveland. *Arch. Internal Med.* 27, 139-67 (1921).—The alveolar CO₂ tension is calcd. from the formula $\text{Alveolar } \% \text{ CO}_2 = (\% \text{ CO}_2 \text{ in expired air}) \times (\text{Vol. of expired air} / \text{Vol. of expired air} - \text{Vol. of dead space air})$ (Cf. Pearce and Hoover, *C. A.* 14, 3712 and Bohr, *Skand. Arch. Physiol.* 2, 348 (1891)). The CO₂ tension in the venous blood is detd. by causing the subject to empty his lungs as much as possible and then to breathe an air-CO₂ mixt. from a 2000 cc. bag which is provided with 2 syringes, of 100 and 360 cc. capacity, for measuring the gases used in making the mixt. and the smaller of which is used to remove samples for analysis. The subject holds his breath for 4 seconds and then expires. A sample is taken, the air is rebreathed and the procedure repeated two or three times. The second and third analyses generally agree and the CO₂ tension is taken as that of the blood supplied to the lungs. From the difference between this value and the alveolar CO₂ tension and the total amt. of CO₂ eliminated, P. calcs. the minute vol. of blood flow through the lungs. In normal men, with moderate work, the vol. of alveolar ventilation, vol. of O₂ absorbed, minute vol. of blood and vol. of O₂ absorbed are increased proportionately and the difference between venous and alveolar CO₂ tensions is not changed. This relation holds until an O₂ consumption of 1100 cc. per min. is reached (walking 3.5 miles per hr.), above which the CO₂ of the venous blood is increased. With an O₂ consumption of more than about 1800 cc. per min. (running 5.5 miles per hr.) the alveolar ventilation increases more than the O₂ consumption and the tension of CO₂ in the alveolar air (and in the arterial blood) is diminished. The respiratory changes compensate for inability of the heart to circulate blood sufficiently rapidly. When they no longer do so, effort

cannot be sustained and a lower level of body activity must be found. "A patient suffering from cardiac disease or pneumonia, or the congenital cardiac subject, or any individual having an impairment in his cardiorespiratory function, is living at the expense of one of the factors of safety which nature has provided for times of physical stress. These patients are, therefore, continually living, as it were, at an energy output level, with reference to their cardiorespiratory function, equal to that of a normal man while at work. The incapacity of such patients to do hard or sudden work is, on these grounds, quite understandable."

I. GREENWALD

Treatment in botulism. VICTOR BURKE, JAY C. ELDER AND DOHRMAN FISCHER. Stanford Univ. *Arch. Internal Med.* 27, 265-304(1921).—"Our own opinion is that infection in human beings following the ingestion of toxin-free organisms never occurs. We are inclined to believe that the organism does produce toxin in the alimentary tract following the ingestion of preformed toxin and after paralysis has set in. . . . Rabbits can be saved from the effects of feeding 2 minimum lethal doses of a toxic culture of *Clostridium botulinum* (*Bacillus botulinus*) by the intravenous injection of the homologous antitoxin as soon as the symptoms appear. Such rabbits cannot be saved if the antitoxin treatment is delayed until the symptoms are well advanced. . . . In outbreaks of botulism, as soon as the first case develops, a polyvalent immune serum should be injected intravenously in all those who have partaken of the suspected meal." A number of substances, including oils, gums, milk, brain, gelatin, eggs, vinegar, HOAc, NaOH, KMnO₄, KI, I, soap and epinephrine, were used in attempts to find a means of neutralizing and counteracting the effects of the toxin. Oils seem to prevent rapid absorption; EtOH, I, NaOH, KMnO₄ and soap appears to neutralize some of the toxin. Oils (olive, etc.) and EtOH are indicated for use by stomach, oil and soap as high enemas.

I. GREENWALD

The relation of hyperthyroidism to diabetes mellitus. REGINALD FITZ. Mass. Gen. Hosp. and Mayo Clinic, Rochester, Minn. *Arch. Internal Med.* 27, 305-14(1921).—"Hyperthyroidism and diabetes occur together in the same person in a small number of cases. There is no established evidence that such coincidence is more than chance. The diabetes usually follows the thyroid disturbance but may precede it and tends to parallel the severity of the thyroid intoxication. There is no reason for assuming that partial thyroidectomy alone has any curative effect on diabetes as the (4) patients in the series with nontoxic goiter who were operated upon showed no improvement of the diabetes. Certain patients with toxic thyroid disease and diabetes, on the other hand, improve to a considerable degree after the thyroid symptoms are checked. This probably occurs because of a change in the rate of metabolism and not because a part of the thyroid gland has been made functionless." "Four patients with non-toxic goiter were operated on with no mortality, six with toxic adenoma with 1 death and 6 with exophthalmic goiter with 1 death." Operation in well-selected cases is advised since prognosis is otherwise very grave.

I. GREENWALD

Administration of a pituitary extract and histamine in a case of diabetes insipidus. R. B. GIBSON AND FRANCIS T. MARTIN. Univ. Iowa. *Arch. Internal Med.* 27, 351-60(1921).—"In a severe case of diabetes insipidus, no relief was obtained by lumbar puncture. The subcutaneous administration of 1 cc. of the obstetrical prepn. of pituitary extract, twice daily, reduced the vol. of the urine from 15 to 4.2 liters. The highest concn. in the hourly specimens was 1.014 and the lowest vol. 57 cc. One injection of 0.2 g. histamine-HCl gave similar but less marked results. Dried whole gland (4 × 3 grains) by mouth had only a very slight effect. Blood analyses, after pituitary treatment, gave normal values except for rather low sugar and high uric acid.

I. GREENWALD

Muscular infantilism. ALEXANDER GIBSON. Winnipeg. *Arch. Internal Med.* 27, 338-50(1921).—"Description of a case of muscular weakness with excess fat, apparently

congenital and hereditary, in a man of 26 which does not closely resemble any previously described type of disease and in which no disturbance of endocrine function could be demonstrated. Blood sugar was normal. Creatine was present in the urine at all times in amts. varying from 0.1 to 0.9 g. per day. I. GREENWALD

The nature of specific hemolysins and a standard method of preparing anti-sheep hemolysin. L. G. HADJOPoulos. Beth Israel Hosp., New York. *Arch. Internal Med.* 27, 441-8(1921).—Injection of the stroma of sheep corpuscles into rabbits and guinea pigs was followed by the appearance of hemolysin but no agglutinin in the serum. The animals were not made anaphylactic to sheep cells. Injection of a soln. of the cell contents after centrifuging off the stroma was followed by anaphylaxis in the animal with the appearance of agglutinins in the serum. The latter contained only a small amt. of hemolysin, which was thought to be due to the fact that the soln. used for injection had not been entirely freed of stroma, as was confirmed by microscopic examn. I. GREENWALD

Action of soy-bean urease on the animal organism. P. CARNOT, P. GÉRARD AND S. MOISSONNIER. *Ann. inst. Pasteur* 35, 1-42(1921).—Urease rapidly destroys the urea contained in blood. Blood, on the other hand, has little action on urease. Urease injected into the body disappears in 48 hrs., being fixed by different tissues, chiefly the liver. It is not recovered from the urine. Acute, fatal intoxication is produced by injection of sufficient quantity, death resulting from ammonemia in 2-3 hrs., when the content of ammonia reaches 0.07 g. per kg. of blood. A slowly developing toxemia follows subcutaneous injection. Urease administered *per os* does not produce symptoms. The liver reverses the action of the enzyme: intoxication develops much more rapidly when the liver is thrown out of commission by injection of CHCl_3 or ligation of the portal vein. The authors could not develop an anti-enzyme, although a precipitin was produced. E. R. LONG

Diagnosis of tuberculosis in cattle by use of the antigen of Besredka. CH. HRUSKA (Prague) AND W. PFENNINGER (Zurich). *Ann. inst. Pasteur* 35, 96-101(1921).—The antigen of Besredka fixes alexin in presence of serum of tuberculous cattle. 84.5% positive reactions were recorded in the sera of 304 known positive cases, confirmed at autopsy. 2.2% of 90 sera where tuberculosis was not demonstrable at autopsy, reacted positively. E. R. LONG

Studies on blood fat. II. Lipemia in acute anemia. YAJIRO HORIUCHI. Harvard Med. School. *J. Biol. Chem.* 44, 363-79(1920); cf. *C. A.* 15, 889.—A marked lipemia was produced in a small rabbit fed on a high fat diet (sunflower seeds, fat content 40%) by repeated drawing of a small amt. of blood amounting to 35 cc. in 3 days. The content of total fatty acids, lecithin and cholesterol in the plasma was 8.41, 3.63, and 4.0 times the original values, resp. In a rabbit on a fat-free diet (carrots, 0.4% fat) a milky plasma appeared only after drawing 10 cc. of blood for 9 days and one additional large hemorrhage of 45 cc.; values 15.52, 7.5, and 3.43 times the original were obtained in this case. In acute anemia produced by one large hemorrhage (45 cc.) in a fat-fed rabbit, the plasma was thick and creamy and contained in 3 cases 12.56, 4.64, 6.5; 19.96, 7.78, 6.17; and 25.48, 6.17, 8.83 times the normal values; on a fat-free diet the amts. were 4.32, 2.55, 2.33 and 7.88, 2.5, 2.0 times the normal values in 2 cases. The lipemia occurs because the animal is unable to utilize the absorbed food fats and mobilized tissue fats in the blood stream; fat feeding causes a considerable increase in the lipemia. The milkiness of the plasma disappears in a relatively short time but the abnormally high fat values persist for 2-3 weeks. The lipemia is a lipodemia but the increase of lecithin and cholesterol is not mathematically proportional to that of the total fatty acids and varied rather irregularly. The lipodemia occurs in the plasma but not in the corpuscles. The increase in total fatty acids is more marked than that of lecithin and cholesterol so that ratio the of total fatty

acids / lecithin is abnormally high while that of lecithin / cholesterol is not particularly changed. The lipemia may be due to a decrease in the amt. of lipase in the blood stream together with a mobilization of stored fat brought about by a severe lowering of nutrition. When the organ which produces lipase, the pancreas, and the organs in which the lipolytic process occurs, such as the spleen, lymphatic glands and liver recover and the lipolytic power of the blood is regenerated, the lipemia disappears. "Leathes' hypothesis that lecithin is a stage through which the fat must pass before it can be utilized in metabolism, was supported by Bloor by the fact that the lecithin value in corpuscles always increased abnormally, when the plasma contained an extra amt. of fat, due to the transformation of fatty acids into lecithin by corpuscles. In the present expts., however, it was not possible to observe this, as the lecithin value in corpuscles was not high. If the above-mentioned theory is true, there should result a hypothesis that the extent of that function of corpuscles would be limited in acute anemia, and therefore the fat constituents in corpuscles remain almost unchanged, while extra fat is left in the plasma without being taken up by corpuscles, resulting in a condition of lipemia."

A. P. LOTHROP

The total carbonate content of the arterial and venous plasma in patients with chronic heart disease. R. W. SCOTT. Western Reserve Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 19-21(1919).—Twenty-eight detns. of total CO_2 content of arterial and venous plasma were made on 10 individuals with chronic heart disease, for the most part young patients with chronic rheumatic myocarditis and valvulitis. Both the arterial (32-51 vol. %) and venous plasma (37-63 vol. %) have a total CO_2 lower than that of normal individuals. The arterial values show wider variation and the difference between the CO_2 of arterial and venous plasma is more marked in heart cases than in normal individuals. There has been a certain relation between the integrity of the circulation and the level of CO_2 in the plasma. The more dyspneic the patient, the lower has been the CO_2 in arterial plasma. The results seem to indicate that, when the minute vol. of air respired at rest is 10 to 12 l. above normal, the plasma CO_2 is low. With improved circulation and fall in the minute vol. the CO_2 of arterial plasma shows a definite increase toward the normal. Cf. C. A. 15, 1752.

V. C. MYERS

The total carbonate content of the arterial and venous plasma in patients with chronic pulmonary emphysema. R. W. SCOTT. Western Reserve Univ. *Proc. Soc. Exptl. Biol. Med.* 17, 21-2(1919).—Six detns. of total CO_2 content of arterial and venous plasma were made over a period of 6 mos. on 3 patients with chronic pulmonary emphysema of so-called "large-lunged" type. The patients were males, between 45 and 50 yrs. of age, and they were free from cardio-renal disease. This type of patient tolerates an unusually high % of CO_2 in the inspired air with little increase in the minute vol. and without any apparent symptoms of distress. This may be explained by the high CO_2 content of the plasma found; arterial plasma contained 70 to 80 vol. % CO_2 , and venous contained 76 to 88 vol. %. Cf. C. A. 15, 1752.

V. C. MYERS

The protein and lipin content of blood serum of nephritic patients. MAX KAHN. Beth Israel Hosp., N. Y. City. *Proc. Soc. Exptl. Biol. Med.* 17, 27(1919); cf. C. A. 14, 566.—Erben reported that in the serum of patients suffering from chronic parenchymatous nephritis, the albumin: globulin ratio is entirely disturbed, showing as 0.2593 of albumin to 7.0352 of globulin, instead of the normal ratio of 1.5-2.0 : 1. Epstein confirmed this deviation and found also a huge amt. of cholesterol in the serum. He puts such cases into a "metabolic or endocrinic" group of nephritic cases, in which the nephritis appears to be secondary to some constitutional disorder. K. has not found 1 case of this type and concludes that the albumin: globulin ratio does not seem to be markedly disturbed by various diseases.

V. C. MYERS

Pregnancy and phenomena of anaphylactic shock. AUGUSTE LUMIERE AND HENRI COUTURIER. *Compt. rend.* 172, 772-4(1921).—In the study of anaphylactic shock

certain guinea pigs were found insensible to intracardiac injections of horse serum, which caused death in less than 3 min. to the majority of the animals in the series. The animals which failed to react were pregnant females. After parturition the state of sensibility reappeared. Similar results were observed with injections of "barytic suspensions" and of serum producing epileptic symptoms. L. W. RIGGS

Susceptibility of rats and mice to trichina infection. HANS GLÄSER. *Arch. Reichsgesundh.* 52, 573-95(1920).—Incidental to a study of the transmission of trichinosis to rats and mice observations were made on the elaboration of toxin by trichinae. The parasites were sepd. from the diaphragmatic musculature and suspended in saline. After incubation and centrifugation the supernatant fluid was injected subcutaneously into white mice. A typical symptom-complex of intoxication followed by death occurred in some of the animals. G. H. SMITH

Effect of repeated bleeding upon antibody formation. KARL W. JÖTTEN. *Arch. Reichsgesundh.* 52, 626-35(1920).—The effect of repeated bleeding upon antibody formation was tested in rabbits immunized with *B. typhosus*. It was found that the repeated withdrawal of either large or small amts. of blood did not lead to an increase in antibody production associated with increased activity in the blood-forming tissues when the bleedings were performed after the antibody concn. of the blood has reached its max. If, however, bleeding was started before the agglutinin titer had attained the highest point, an increase in antibody concn. occurred. The effect of bleeding in rabbits in which the typhoid carrier state has been established was always an increase in antibody titer which was maintained for a considerable period. This increase is attributed to a lowering of the bodily resistance by bleeding, thus permitting the organisms previously localized in the gall bladder to re-enter the circulation and afford additional stimulus to antibody formation. In such carrier rabbits an increase in circulating agglutinins could be produced by an intracutaneous injection of vaccine virus or by an intravenous or subcutaneous injection of cow milk. G. H. SMITH

ENGEL, C. S.: *Diagnostischer Leitfaden für Sekret und Blutuntersuchungen*. 2nd Ed. Leipzig. George Thieme. 303 pp. M. 15.50, bound M. 22 + 60% Teuerungszuschlag. For review see *Z. Urol.* 14, 430(1920).

HOROWITZ, PHILIP: *Diabetes: A Handbook for Physicians and their Patients*. New York: Paul B. Hoeber. 196 pp. \$2. For review see *J. Am. Med. Assoc.* 76, 402(1921).

McCONNELL, GUTHRIE: *Manual of Pathology*. 4th Ed. Philadelphia: W. B. Saunders Co. 611 pp. For review see *Am. J. Med. Sci.* 161, 442(1921).

NICOLLE, M.: *Les antigènes et les anticorps*. Paris: Masson et Cie. 80 pp. 4 fr. 50 net. For review see *Rev. sci.* 59, 127(1921).

PRICE-JONES, CECIL: *Blood Pictures: Introduction to Clinical Hematology*. 2nd Ed. Bristol, England: John Wright & Sons, Ltd. 63 pp. 6s. 6d. For review see *Pharm. J.* 106, 252(1921).

H—PHARMACOLOGY

ALFRED N. RICHARDS

Acute nitrobenzene poisoning, with studies on the blood in two cases. ROBERT F. LOEB, A. V. BOCK AND R. FITZ. *Am. J. Med. Sci.* 161, 539-46(1921).—The O capacity of the blood is reduced, methemoglobin is absent, nitrobenzene-hemoglobin present, and the urine elimination greatly decreased. Bleeding and transfusion of blood is beneficial in severe cases. H. V. ATKINSON

Excretion of formic acid from the human organism after administration of methanol, hexamethylenetetramine, sodium formate, sodium lactate, and dextrose. W. AUTENRIETH. *Arch. Pharm.* 258, 15-33(1920); *J. Chem. Soc.* 118, I, 909-10.—Formic acid is a normal and fairly constantly occurring constituent of human urine, varying in

quantity within somewhat wide limits with different individuals and with varying diet, but from 0.5 to 0.65 g. per 48 hrs., or an av. of about 0.28 g. per day, may be regarded as a normal amt. Administration of MeOH causes a notable increase in the CO_2H_2 excreted, particularly on the 3rd or 4th day following, the total excess over the normal representing about 5% of the MeOH taken. The mere presence of CO_2H_2 in the urine is accordingly insufficient to establish MeOH poisoning. In such a case, a quant. examn. indicating something of the order of 1 g. of CO_2H_2 per day is essential. In no case was CH_2O found in the urine after the administration of MeOH, although possibly traces of the latter might be found unchanged. This, together with the fact that, after the administration of $\text{C}_6\text{H}_{12}\text{N}_4$ (urotropine), large quantities of CH_2O , but no increase in the amt. of CO_2H_2 , were found in the urine, shows that CH_2O is not, as has been supposed, an intermediate product of oxidation in the animal organism. CO_2H_2 , administered as its Na salt, underwent partial combustion, 18% only being found unchanged in the urine. Neither Na lactate nor dextrose caused any abnormal increase in the excretion of CO_2H_2 , even when administered in large quantities. W. O. E.

A study of the pharmacologic action of the members of the acridine and acridinium groups. EMIL LENZ. Bern. *Z. ges. expil. Med.* 12, 195-26(1921).—The acridine derivs. studied exhibited a marked antiseptic action against protozoa *in vitro*, which was twice as strong as that of quinine. The acridines are general protoplasmic poisons. Acridine poisoning affects the respiratory function most markedly. Respiratory failure is the cause of death in warm-blooded animals, while in frogs cardiac failure results. The fluorescent action of acridine can be demonstrated on the isolated frog heart, but it plays no role in the toxic action on higher animals. The quaternary acridinium compds. which contain NH_3 possess no curare action either in cold- or warm-blooded animals as proved by the most sensitive methods. The reason for this is the pseudobase reaction of acridine. The absence of curare action in the acridinium groups furnished exptl. support for the Meyer-Fühner hypothesis, which maintains that the free bases and not the salts in the cells are responsible for the curare action. The substance with 2 amino side-chains exhibits the respiratory, circulatory and central effect of acridine in increased degree. Intravenously it is 8 times more toxic than trypanflavin. E. B. FINK

Tetrachloroethane poisoning and its prevention. D. C. PARMENTER. Harvard Med. School. *J. Ind. Hyg.* 2, 456-65(1921).—A description of C_2Cl_4 , its properties used and the conditions under which it is poisonous, with the symptoms, treatment, and suggestions for prevention. It is probably poisonous through inhalation, possibly also from skin absorption. General malaise with jaundice gastric disturbance and nervous symptoms characterize its effects. Fresh air and complete removal from contact insure recovery. Forced ventilation is the chief preventive measure advocated. H. C. HAMILTON

Influence of intravenous injections of acacia-glucose solutions on urine excretion and blood volume in rabbits. P. M. MATTILL, KATHERINE MAYER AND L. W. SAUER. Otho S. A. Sprague Memorial Inst., Chicago. *J. Pharmacol.* 16, 391-9(1920).—Acacia is capable of maintaining the blood vol. in spite of a very marked glucose diuresis. Injecting acacia-glucose mixt. wherein the glucose is present in concns. of 30 to 40% in quantities of about 0.5 of the rabbit's blood vol. in 1.5 hrs., a decrease of the blood vol. is practically prevented by the presence of 3% acacia in the injection fluid. Glucose injections without acacia produce uniformly a diminution of the blood vol. C. J. WEST

Some observations upon the behavior of a fixed oil (peanut oil) injected intraperitoneally. ERICH W. SCHWARTZ. Bur. Chemistry, U. S. Dept. Agr. *J. Pharmacol.* 17, 115-9(1921).—Peanut oil, injected into the peritoneal cavity, is apparently harmless and is slowly absorbed. This problem merits a more detailed study. C. J. WEST

Study on the action of poisons. The action of atoxyl on serum lipase. P. RONA AND E. BACH. *Biochem. Z.* 111, 166-87(1920).—The toxic effect of atoxyl on the action of serum lipase on tributyrin was studied stalagmometrically. The results are given in many tables and lead to the conclusion that the relation between enzyme activity and concn. of toxic substance is expressed in the equation: $\text{const.} = (K_A - K_B) / (\log B - \log A) = X$, where K_A and K_B represent the velocity consts. at the concns. A and B of the toxic compd. When the enzyme concn. is varied while the amt. of toxin remains the same, the retardation coeffs. ($h_A = (K_0 - K_A) / K_0$ where K_0 is the velocity const. when no poison is present, K_A that existing when the poison is present in concn. A) are the same. From this it follows that $X/K_0 = \text{const.}$ The value of this const. depends on the general sensitiveness of the enzyme towards the poison, that is to say the sensitiveness of the enzyme to changes in the concn. of the poison. This sensitiveness varies absolutely as well as relatively in different animals. Tributyrin exerts a protective action.

F. S. HAMMETT

Habituation to bromine vapor and action of the latter on the blood. S. MARINO. *Arch. farm. sper.* 29, 48-64(1920).—Respiration of Br vapor causes diminution of the number of red corpuscles and of the content of hemoglobin in the blood. The extent of this diminution increases with the quantity of the vapor administered, but not with repetition of the treatment. Habituation of the animal organism to Br vapor is attainable by gradual increase of the dose, but even continued small doses produce hemolysis. The vapor conditions marked increase in the leucocytes, sometimes to about 4 times their normal number.

J. C. S.

Decomposition products of atractylin in the animal organism. A. PITINI. *Arch. farm. sper.* 29, 88-96(1920).—In an alk. medium, atractylin, which has the probable formula $C_{20}H_{26}O_{10}S_2K_2$, decomposes, yielding sulfuric and valeric acids, a carbohydrate and a complex product (A), which is obtained as a white powder, and gives the following reactions: in concd. H_2SO_4 containing traces of CH_3O it dissolves to a red soln., which is turned deep blue by addition of a small quantity of water; with concd. H_2SO_4 and a few drops of aq. vanillin soln., it yields an intense carmine-red coloration. By means of these reactions, the gastrointestinal contents and various organs of a dog poisoned with atractylin were shown to contain this product A .

J. C. S.

Behavior of aspirin in the animal organism. A. PITINI. *Arch. farm. sper.* 29, 113-8(1920).—Investigation of the urine of dogs to which aspirin had been administered indicates the presence of unchanged aspirin, so that part of the aspirin is absorbed in the animal organism before undergoing hydrolysis.

J. C. S.

Advantages of preventive quininization shown and determined experimentally (malaria of birds). ETIENNE AND EDMUND SERGENT. *Ann. inst. Pasteur* 35, 126-41 (1921).—Healthy canaries which have received preventive doses of quinine, such as 0.7 mg. daily for three weeks, are resistant to inoculation of large doses of blood of infected birds. This resistance is maintained, however, only as long as quininization is continued.

E. R. LONG

Antagonism of inhibitory action of adrenaline and depression of cardiac vagus by a constituent of certain extracts. J. B. COLLIP. Univ. Alberta. *Am. J. Physiol.* 53, 343-54(1920).—Exts. made from heart, spleen, pancreas, testes, anterior and posterior lobe of the pituitary body, and the thymus, thyroid and parathyroid glands, in addition to stimulating the isolated uterus of the rat, guinea pig, virgin dog and cat, antagonized the inhibitory action of adrenaline on this tissue. Exts. of heart and spleen caused complete abolition of the response of the cardiac vagus to elec. stimulation. The substance or substances which antagonize the inhibitory action of adrenaline on the uterus and depress the cardiac vagus are sol. in EtOH and resist boiling. J. F. LYMAN

The role of the pancreas in hyperglucemia from ether. E. L. ROSS AND L. H. DAVIS. Northwestern Univ. Med. School. *Am. J. Physiol.* 53, 391-8(1920).—

Et_2O does not bring about the mobilization of sugar in the animal without a pancreas, as it does in the normal one. Since the pancreas inhibits glucolysis, it is concluded that Et_2O reduces the activity of the pancreatic internal secretion of normal dogs, and thus increases dextrose mobilization.

J. F. LYMAN

Antagonism of depressor action of small doses of adrenaline by tissue extracts. J. B. COLLIP. Univ. Alberta. *Am. J. Physiol.* 53, 477-82(1920).—Antagonism, of short duration, between various tissue exts. and the action of adrenaline on blood pressure were noted. Some part of the vasodilator mechanism is depressed by the tissue exts.

J. F. LYMAN

Effect of adrenaline on venous blood pressure. HELENE CONNET. Johns Hopkins Univ. *Am. J. Physiol.* 54, 98-121(1920).—The rise of venous blood pressure in dogs and cats after intravenous injection of adrenaline is due to 2 factors: (1) decreased heart rate, and (2) vasoconstriction of the veins. The first factor is accentuated by the greatly increased arterial blood pressure.

J. F. LYMAN

Further observations on the relation between chemical constitution and antiseptic action. C. H. BROWNING, J. B. COHEN AND R. GULBRANSEN. *J. Path. Bact.* 24, 127-8(1921); cf. *C. A.* 15, 106.—No fragment of the acridine mol. including the hydrochlorides of quinoline, tetrahydroquinoline, *o*-, *m*-, and *p*-aminoquinolines, the methochlorides of aminoquinolines, β - and α -naphthoquinoline, dinaphthoimine, *o*-aminopyridine, and dimethylaminopyridine, was equal to diaminoacridine in antiseptic powers. The substitution of the following radicals for the methyl group in diaminoacridine had little effect: ethyl, propyl, butyl, isobutyl, isoamyl, phenyl, benzyl, and the glycine, propiono and acetanilide derivs. The substitution of alkyls in the amino group of diaminoacridine had little effect, but sometimes depressed the antiseptic action. The substitution of H in each of the amino groups by acetyl radicals practically abolishes the antiseptic action.

JOHN T. MYERS

FRHY, E.: *Die Wirkungen von Gift- und Arzneistoffen.* Vorlesungen für Chemiker und Pharmazeuten. Berlin: Julius Springer. 176 pp. M. 26, bound M. 33. For review see *Pharm. Weekblad* 58, 139(1921).

MCGUGAN, HUGH: *Introduction to Chemical Pharmacology. Pharmacodynamics in Relation to Chemistry.* Philadelphia: P. Blakiston's Son & Co. 418 pp. \$4.

I—ZOOLOGY

R. A. GORTNER

The alkali reserve of marine fish and invertebrates. The excretion of carbon dioxide. J. B. COLLIP. Marine Biol. Sta., Departure Bay, Can. *J. Biol. Chem.* 44, 329-44(1920).—The blood or celomic fluid was obtained while the individual specimens were in a perfectly fresh condition and the alk. reserve detd. using the Van Slyke-Cullen app. Many species of the following phyla or orders were studied: Coelenterata, Brachiopoda, Echinodermata, Arthropoda, Mollusca, Cyclostomata, Pisces, and Reptilia. The CO_2 content of the body tissues equilibrated with atmospheric air of Medusae and sea anemones, the celomic fluid of brachiopods, starfish, certain sea urchins, and a number of mollusks and the blood of the dogfish and the ratfish was found to be relatively low but in all cases higher than that of sea water which varied between 2-4 vol. %. Certain types of Crustacea have a relatively high CO_2 content (18 to 28 vol. %) while in other types the amt. is comparatively low (10 vol. %). In the majority of the mollusca the amts. ranged from 6.3 to 11 but in certain species it was considerably higher. The CO_2 content of the blood of marine Teleostei is approx. 10 vol. % but in the dogfish (*Squalus sucklii*) and the ratfish (*Hydrolagus collieri*) it is approx. 5.6 and 4.2, resp. "It is held that in order to maintain the const. reaction of the blood or body fluids of marine forms the CO_2 tension must be considerably higher in the blood and body fluids than it is in sea water. The existence of a definite pressure

gradient for CO_2 between the tissue and the sea water suggests that a definite mechanism exists for regulating the tension of this gas in the body fluids and tissues. Further expts. only can furnish a full explanation of this phenomenon." A. P. LOTBEROP

Studies on molluscan celomic fluid. Effect of change in environment on the carbon dioxide content of the celomic fluid. Anaerobic respiration in *Mya arenaria*. J. B. COLLIP. Marine Biol. Sta., Departure Bay, Can. *J. Biol. Chem.* 45, 23-49 (1920); cf. preceding abst.—Exposure of calcareous shelled pelecypod Mollusca and the arthropod *Balamus aquila* to the air caused a marked increase in the combined CO_2 , the Ca content and in the buffer value of the celomic fluid. There was no increase in the nitrogen content. *Mya arenaria*, being particularly resistant to long exposure to air, was used for other expts. It was found that when specimens were placed in fresh or boiled sea H_2O , distd. H_2O , or in an atm. of H or of N, the combined CO_2 , Ca and buffer value of the celomic fluid were similarly increased, though not to so great an extent as in air. The CaCO_3 of the shells is regarded as the potential alk. reserve. "It is suggested that *Mya arenaria* is a facultative anaerobic organism which continues to produce CO_2 under anaerobic conditions." I. GREENWALD

A theory of injury and recovery. II. Experiments with mixtures. W. J. V. OSTREHOUT. Harvard Univ. *J. Gen. Physiol.* 3, 405-29 (1921).—This is an extension of studies on the changes in elec. cond. of the tissues of *Laminaria agardhii* when transferred from sea water to certain salt solns. and the relation of these changes to injury and recovery. It has been found (C. A. 15, 540) that the changes which occur on transferring to NaCl or CaCl_2 soln. can be predicted by certain equations, for the derivation of which the above-mentioned paper and C. A. 10, 2744, must be consulted. In the present study, the same equations have been used to predict the changes in cond. when the tissue is transferred from sea water to mixts. of NaCl and CaCl_2 and then replaced in sea water. The predictions are in good agreement with exptl. facts.

CHAS. H. RICHARDSON

The rate of ovulation in the domestic fowl during the pullet year. SAMUEL BRODY. Mo. Agric. Expt. Sta. *J. Gen. Physiol.* 3, 431-7 (1921).—Using data from Pearl (U. S. Bur. Animal Ind., *Bull.* 110 (1910)) and Card and Kirkpatrick (Storrs Agr. Expt. Sta., *Bull.* 100 (1919)), B. shows that a curve for a typical monomolecular reaction is obtained when the proper values are inserted in the formula, $\log \{x/(A-x)\} = K(t-t_1)$. The significance of these results is summarized as follows: "The rate of ovulation of the domestic fowl may be expressed by the equation of an auto-catalytic chem. reaction. This is not surprising in view of the fact that the ratio of growth may also be expressed by such an equation and that the rate of ovulation is probably an index of the growth of the eggs. This brings the phenomenon of ovulation in the hen under the general subject of growth, and substantiates the generality and the probability of the hypothesis that growth, or at any rate the limiting factor of growth, is an autocatalytic reaction."

CHAS. H. RICHARDSON

An investigation into the cause of the spontaneous aggregation of flagellates and into the reactions of flagellates to dissolved oxygen. I and II. H. MONRO FOX. Marine Biol. Association, Plymouth, England, and School of Medicine, Cairo, Egypt. *J. Gen. Physiol.* 3, 433-99, 501-11 (1921).—*Bodo sulcatus* forms spontaneous aggregations under the cover glass, because it is attracted to, and remains in, regions where the concn. of O_2 dissolved in the medium is less than the satn. concn. under atm. pressure. These regions of reduced O_2 concn. arise toward the center of the cover-glass area due to the fact that the O_2 withdrawn from the medium by the organisms is not so quickly replaced as it is nearer the edges of the prepn. There is, however, a limiting concn. of O_2 , and the concn. of the medium must fall below this before aggregation will proceed; thus the flagellates are chemotropic to the lowered concn. of O_2 . As the area of limiting concn. increases, the organisms form a bordering band enclosing it and eventually

occupy a region near the edge of the cover glass where the concn. is optimum. Concns. of O_2 greater than the optimum have no injurious effect; lower concns. inhibit movement of the organisms, but they recover this when given access to O_2 again. Previous work done on the chemotropism of flagellates will need revision because the O_2 concn. of the solns. has not been taken into account.

CHAS. H. RICHARDSON

Reactions and susceptibility to irritation of *Vorticella nebulifera*. FELIX DANISCH. *Z. allgem. Physiol.* 19, 133-90(1921).—An extended exposition of exptl. data upon the reactions of *Vorticella nebulifera* when subjected to mechanical, thermic, electrical stimuli, and to irritation due to chemicals such as dyes, org. and inorg. acids, hydroxylamine, bases, alkalies and alk. earths, choral hydrate, carbohydrates, proteins, bacterial exts., and metals.

G. H. S.

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Serologic method for detecting infection in foods. J. BRONFENBRENNER AND M. J. SCHLESINGER. Harvard Med. School. *Proc. Soc. Exp. Biol. Med.* 17, 24-5(1921).—The isolation and identification of the infecting organism in contaminated foods is difficult and often unsuccessful. By this method the entire sample of food can be analyzed for any organism or its split products. The whole sample is chopped up and an ext. made from it. This ext. is concd. so that all the specific bacterial protein is collected in a very small vol. of liquid. This is then tested against a set of specific immune sera. The presence of *B. botulinus* protein was detected in 20-g. samples of artificially inoculated food, where the concn. of toxin was so small that at least 7 g. by mouth, or 1.3 g. by injection into a 15-20-g. mouse, would have been required for a positive result. This procedure can be completed within 24 hrs. after receiving the specimen. It is necessary to have on hand a collection of specific sera of high titer. V. C. MYERS

Study of several new methods for the detection of watering of milk. UTZ. *Z. angew. Chem.* 34, Aufsatzteil, 21-2(1921).—The $AgNO_3$ method of Durand (*C. A.* 11, 372), the method of Knappe (*C. A.* 8, 3476) and that of Gero (*C. A.* 12, 73) are considered unserviceable in practice. Methods based on the property of refraction of light of the milk serum are considered the best. The method of Sanfelici (*C. A.* 8, 1625) for prepn. of the serum with 50% tartaric acid is recommended for practice. Ackermann's method on a serum prepd. according to Ambühl and Weiss (*C. A.* 13, 2095) is considered the best procedure.

H. A. LEPPER

Color reaction of milk in presence of formaldehyde. ARTHUR ROSSI. *Boll. chim. farm.* 59, 265-8(1920).—The presence of CH_2O in milk may be detected by adding 2-2.5 cc. of the milk carefully to 2 cc. of H_2SO_4 (d. 1.820-1.825) in a test-tube, so that the liquids mix as little as possible, and then shaking the tube rapidly; the liquid assumes a more or less intense violet color, according to the proportion of CH_2O present. The best conditions for the reaction vary with such proportion, the sensitiveness diminishing with more than 0.0005% of the aldehyde; in doubtful cases the samples to be tested may be diluted with pure milk. Other substances may be examd. for CH_2O by subjecting them to distn., mixing part of the distillate with pure milk, and applying the H_2SO_4 reaction. Milk free from CH_2O sometimes gives this violet coloration, but only after being in contact with the H_2SO_4 for some hours. J. C. S.

Industrial classification of starches and flours. Their commercial designations. ARPIN. *Ann. chim. anal. chim. appl.* 3, 74-84(1921).—Gives moisture, ash, nitrogenous matter and microscopical description of flours, amidos (= starches from cereals and grains) and feculas (= starches from roots, rhizoms, trunks, etc.). Data include the following: flours—wheat, corn, rice, tapioca; amidos—wheat, corn (pearl and powder),

rice, sorghum; *feculas*—tapioca (including flake and pearl), potato and sweet potato (Japanese), arrow root, sago. JEROME ALEXANDER

Gluten and water-soluble protein in 65% wheat flours of the harvest of 1919. M. P. NEUMANN AND E. MAYER. *Z. ges. Getreidew.* 13, 11-4(1921).—Analyses of 10 samples of grain and corresponding flour for H₂O, ash, protein, H₂O-sol. protein, and gluten are given. The av. protein was 12.45% in grain and 11.34% in 65% flour, 12.4% of the former and 16.9 of the latter being sol. in H₂O, showing 90% of the sol. protein of the grain in the flour. The av. gluten in the flours was 9.6%, the gluten N being 85% of the total N. H. A. LEPPER

The manufacture of war flour and several known special flours. JOHANNES BUCHWALD. *Z. ges. Getreidew.* 13, 1-11(1921).—The process for manu'g. 94% flour is described; comparison with white flour is made. B. believes "peace" flour is better suited for general consumption. Other special flours are described. H. A. LEPPER

Meat extract, prepared during corned-beef manufacture. UDO KLÜNDER. San Antonio, Paraguay. *Chem. Ztg.* 45, 225(1921).—The prepn. of meat ext. and corned-beef from the same meat is discussed. Cf. *C. A.* 15, 712. H. A. LEPPER

Interpretation of candy analysis. CHESTER C. FOWLER. *Chem. Bull.* (Chicago) 8, 30-1(1921).—Analysis of marshmallow, composed of gelatin, cane and corn sugars, is interpolated to give 4 different formulas for factory production. Two methods for detg. the ratio of cerealine and coconut in a product are given. H. A. LEPPER

Studies on the cassaba and honey dew melons. HEBER W. YOUNGKEN. *Am. J. Pharm.* 93, 104-115(1921).—Investigation into the origin, history, structure and chem. compn. of the "cassaba" and "honey dew melons." The following chem. analysis of the fruits is reported: "*Cassaba melon*," total wt., 3316.9 g.; wt. of seeds and placenta, 293.0 g.; wt. of rind, 1360.0 g.; total refuse, 1653.0 g.; amt. of edible portion, 50%; moisture, 89.05%; ash, 0.80%; crude fiber, 0.54%; protein, 1.21%; reducing sugar before inversion, 1.87%; reducing sugar after inversion, 2.76%; fat, none. "*Honey dew melon*," total wt. 1388.3 g.; wt. of seeds and placenta, 87.0 g.; wt. of rind, 680.0 g.; total refuse, 767.4 g.; amt. of edible portion, 45%; moisture, 90.52%; ash, 0.52%; crude fiber, 0.36%; protein, 0.51%; reducing sugar before inversion, 2.05%; reducing sugar after inversion, 4.04%, and fat, none. W. G. GAESSLER

Application of the Van Slyke method to hydrolyzed protein extracts of silage crops. RAY E. NEIDIG AND ROBT. S. SNYDER. *J. Am. Chem. Soc.* 43, 951-9(1921).—Analyses were made of various feeding stuffs before and after siloing by both the old and the new methods of Grindley and Eckstein (*C. A.* 10, 2256; 13, 2049); in applying the new method N. and S. detd. in addition the N in the Et₂O and alc. exts., which G. and E. did not do; as in their work they used the cereal grains and concd. feeding stuffs, it is possible that no appreciable amt. of N was extd. In some of the legume silages a large amt. of N was found, especially in the alc. ext. of silage made from peas and alfalfa. A considerable amt. of the N in the exts. is in compds. that yield NH₃ when aerated from alk. soln. The new method usually gives a slightly lower % of humin N, but the lowering is very slight. The high values given even by the new method are no doubt due to the high % of cellulose. The total N of the bases is slightly lower after siloing, but when a comparison of the individual bases is made the results show some glaring irregularities. Not only is there apparently no relation between the amts. of individual bases before and after siloing, but the % of the bases are variable. In almost all cases the % of N is below 100%. One source of error was noted too late to det. the actual % lost. With the phosphotungstic acid ppt. of the bases there is usually formed a dark substance (Gortner's phosphotungstic humin); the greater part of this N is recovered in the Ba phosphotungstic ppts. The results of N. and S.'s work do not warrant the hope that the protein of forage crops, containing such a large

quantity of cellulose which cannot be removed, can be successfully analyzed by the Van Slyke method but it is believed that with the new G. and E. method a fair interpretation of the protein mol. can be obtained in the case of such concentrates as contain but little cellulose.

CHAS. A. ROULLER

Sugar content of *Phragmites communis*. T. SABALITSCHKA. *Pharm. Ztg.* 66, 178(1921).—A new investigation of the subject in order to refute certain inordinate claims for the commodity as a feed.

W. O. E.

The destruction of pentosans in the formation of silage. W. H. PETERSON, E. B. FRED and J. H. VERHULST. *Univ. Wisc. J. Biol. Chem.* 46, 329-338(1921).—Pentosans were detd. in the dried corn fodder and silage. The fodder contained from 21.2 to 22.2%, av. 21.8% of which 0.34% was methylpentosans; the 50-day old silage, from 17.6 to 20.9%. Assuming a loss of at least 10% solids, at least 15-20% of the pentosans disappear during the fermentation. H_2O -sol. furfural-yielding substances are present in fodder and silage in amts. equiv. to 0.6% pentose.

I. GREENWALD

The relation of lactic acid bacteria to corn silage. E. B. FRED, W. H. PETERSON and J. A. ANDERSON. *Univ. Wisc. J. Biol. Chem.* 46, 319-27(1921).—Bacteriol. and chem. analyses of inoculated (*Lactobacillus pentoaceticus*, mixt. of *Bacillus lactis acidii* and *B. bulgaricus* or a mixt. of all three) and of uninoculated silage indicates that the organisms of the *B. lactis acidii* type may act for the first few days and increase the formation of non-volatile acid but that they are rapidly outgrown by pentose-fermenting organisms so that "in the latter stages both chem. and bacteriol. analyses of all inoculated and uninoculated silage show approx. the same chem. compn. and the same kinds of microorganisms."

I. GREENWALD

Vitamines and the food supply (HARDEN) 11E. Evaporation of liquids (milk) (Brit. pat. 155,927) 13.

Codex alimentarius. No. 6. Suikers, honig, vruchtensappen, jams en limonades. Groningen: P. Noordhoff. 77 pp. f. 4.50, by subscription f. 3.80. For review see *Pharm. Weekblad* 58, 138(1921).

BAIER, E.: Bujard-Baiers Hilfsbuch für Nahrungsmittelchemiker zum Gebrauch im Laboratorium für die Arbeiten der Nahrungsmittelkontrolle, gerichtlichen Chemie und anderen Zweige der öffentlichen Chemie. 4th Ed. revized. Berlin: Jul. Springer. 884 pp. M. 90. For review see *Z. angew. Chem.* 34, I, 80(1921).

FORNET, A.: Die Theorie der praktischen Brotbereitung. Berlin: F. A. Günther & Sohn. 176 pp. M. 19.50. For review see *Chem. Ztg.* 45, 9(1921).

Edible yeast preparations. H. PLAUSON and J. A. VIRLLE. *Brit.* 156,153, Dec. 31, 1920. To improve the taste of yeast and to render it more digestible it is treated with H under heat and pressure. It may first be treated with a soln. containing $(NH_4)_2CO_3$ or Na_2CO_3 or borax and washed to remove the bitter flavor, and disintegrated in any known way. It is then treated with H at a pressure of 100-200 atm. and a temp. of 100-130°. The liquid thus obtained may be used directly, mixed with fats or oils to form an artificial milk, or dialyzed by electroösmosis or otherwise to remove salts. The action is facilitated by the presence of small quantities of NaCl, or org. acids such as $HCOOH$, $HOAc$, tartaric, or citric acid. The yeast may also be first reduced to dry powder and treated with H in this state. Catalysts such as Ni or Pd may be employed, in which case the yeast must be washed after treatment.

Butter substitutes. J. E. GREEN. *Brit.* 156,000, Jan. 9, 1920. In the manuf. of margarine, the hard fats and oils are melted and subjected to agitation while soured milk is added, the emulsion being matured and then cooled under continuous and rapid agitation. The process is performed in a single vessel, to the jacket of which a heating

or cooling medium is supplied. A removable strainer may be placed in the vessel, to be withdrawn after melting the fats in order to remove foreign matter. A suitable construction is specified.

Condensing buttermilk. I. S. MERRILL. U. S. 1,370,828, Mar. 8. Buttermilk is condensed by allowing it to flow spirally upon the interior surface of a heated cylinder under high vacuum.

Cooling and solidifying fats. W. CLAYTON and G. NODDER. Brit. 155,477, Nov. 6, 1919. App. for treating edible fats in the manuf. of margarine or lard substitutes comprises a series of hollow disk-like plates communicating with one another through openings so as to form a continuous zigzag passage for a cooling medium entering by an opening and leaving by an opening, the fats, etc., being forced through passages between the plates and the solidified material being removed by scrapers on a rotating shaft. The passages for the fats, etc., communicate with one another through alternate openings in a position at right-angles to the openings. A suitable app. is specified.

Apparatus for manufacture of feeding stuff and recovery of fat and by-products. G. ZWICKY. Ger. 323,118, Apr. 25, 1919. The material is heated in a steam-jacketed vessel and air-dried after removal of the fat. The app. is provided with a plurality of air-ducts adapted to conduct hot compressed air through the constantly stirred sludge of material under treatment, in order to effect a rapid and complete desiccation of the material and removal of the malodorous constituents.

Apparatus for pasteurizing milk, whey or other liquids. H. G. LIEBZEIT. U. S. 1,371,038, Mar. 8.

Determination of moisture in cereals, etc. SOC. ANON DES GRANDS MOULINS VILGRAIN and M. CHOPIN. Brit. 155,486, Feb. 25, 1920. Addition to 143,191. In app. of the kind described in the principal patent, the heating chamber through which the grain, etc., is passed is surrounded by a cast-iron cylinder, which tends to preserve uniformity of temp. even when the current through the heating coils varies. A suitable app. is specified.

13—GENERAL INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

HARLAN S. MINER

The chemical industry from a tariff viewpoint. C. R. DeLONG. *Chem. Met. Eng.* 24, 712-3(1921).—An address of the chief chemist of the tariff Commission including indirect competition (*i. e.*, soy-bean oil *vs.* cottonseed oil), compensatory duties (*i. e.*, barytes and lithopone, oils and oil seeds), tariff classification (similitude, omnibus clauses), specific *vs.* *ad valorem* duties, etc. Also in *J. Ind. Eng. Chem.* 13, 470-2(1921).

JEROME ALEXANDER

The heat pump in theory and practice. FRITZ KRAUSS. *Power* 53, 298-300(1921).—The "heat pump" is an app. by means of which mechanical work can be converted into heat. In this respect it is contrary to a heat engine. It may seem inconsistent that any useful or economical effect could be derived from a contrivance that consumes the high-grade energy of mechanical work and furnishes instead the low-grade energy of heat, but this is just what the so-called heat pump does. Comparisons are given of the cost of coal and electricity for industrial process heating and methods of applying heat in industrial processes. The theory of the heat pump is explained. With the same expenditure of energy 20 times as much process heating can be done with the heat pump as by using electricity directly. By means of the heat pump, therefore, the processes of cong. and distg. liquids can be carried out in the most economical manner, whether the mechanical work of driving the compressor be furnished by a steam or a water-power plant. In the latter case it is worth remarking that industries depending on

fuel or heat for concg. liquids may now totally dispense with steam and fuel. Although the principle of the heat pump is not new it was not at first used with success for the piston compressors which were then employed were not adequate for the purpose of handling large vols. of steam. The modern high-speed rotary compressor, with the recent perfections brought to it, seems, however, satisfactorily to fill all the requirements. It is now attracting attention particularly in Central Europe. H. S. M.

Experiments with heat pumps at water-distillation plants. ОМБЕК. *Z. Ver. deut. Ing.* 65, 64-6(1921).—The use of a heat pump as a means for economizing on fuel in evapg. and boiling operations, by utilizing more fully the energy of waste steam, deserves careful consideration. Theoretical foundations for the process were laid 50 years ago in studying refrigerating machines, but expts. by Linde in 1876 on an alc. still, and by others several years later on brine evapn. were not successful commercially. Nowadays technical journals contain many accounts of successful operation of such plants, but usually no data as to construction and operation are published. The Linde Co. made preliminary investigations in 1894, with inappropriate app., and in 1914 installed perfected machinery at the Dresden ice works. For power generators suction gas producers and Diesel engines were used. Water distn. for ice manuf. was carried out with a turbocompressor (condenser), coupled with an elec. motor, in the steam line. Precautions were taken to utilize heat as fully as possible. Tabulated and plotted data from runs made under widely varying conditions indicate efficient operation, and show promise of great com. success. Cf. preceding abstr. W. C. EBAUGH

The recovery of solvent-vapors from air: the use of cresol and of sulfuric acid for ether and alcohol. I. MASSON AND T. L. McEWAN. *J. Soc. Chem. Ind.* 40, 32-8T(1921).—A description of two laboratory investigations dealing with the use of cresol and of H_2SO_4 for recovery of Et_2O - $EtOH$ vapors highly dil. with air. They relate to the efficiency with which the scrubbing liquid absorbs the vapors and to conditions for sepg. the absorbed material from it. In these tests, under equil. conditions, Henry's law applies. The coeff. (k) is defined as "the equil. ratio between the wt. of substance dissolved per kg. of cresol and the wt. remaining as vapor per cu. m. of air." In general if q kg. of absorbent be brought into equil. with 1 cu. m. of air, then whether the absorbable constituent were initially all in the air, all in the absorbent or divided between them, the final result would be that of the total wt. of it present, a fraction $qk/(qk + 1)$ must remain in the liquid." 75% H_2SO_4 is equiv. to cresol in Et_2O absorption but where Et_2O and $EtOH$ are to be removed the acid method cannot compete with the cresol method, owing to re-concn. costs. In absorption Et_2O presents the greater difficulties, whereas in distn. it is easily recovered while the temp. and concn. of the acid det. the efficiency of the $EtOH$ recovery. Two tables based on vapor pressures specify for any simple scrubbing liquid and any gas the minimum rates of flow and number of "effects" required to give stated efficiencies of absorption.

W. H. BOYNTON

Mixing. OTTO STIER. Heidelberg. *Chem. Ztg.* 44, 902-5(1920).—A survey of the recognized com. methods for mixing liquids with liquids, liquids with solids, and solids with solids. This includes descriptions of shaking, stirring, and air-current methods for liquids and sludges; kneading and churning for plastic masses; and shaking, stirring and rotating for solids. Numerous diagrams and explanations are given to show approved app. and equipment. C. C. DAVIS

Plastic masses. H. BRÜCHER. Leipzig. *Chem. Ztg.* 44, 905-7(1920).—A description of the classes of com. materials falling under the category of plastic masses. B. divides the important and most useful products into 6 classes, (1) glues, (2) papier maché, (3) wood products, (4) cellulose products, (5) egg white and casein, and (6) resins. The criterion for plastics is the condition of the raw material or of the final product. From this point of view B. takes exception to the older classifications of

plastics based on some temporary condition during manuf. The important uses, varieties and synthesis of each of the groups are sketched, but with no attempt to treat comprehensively.
C. C. DAVIS

Solvents produced by bacteria (HALL) 16. Paraffin wax; lubricating oils (Brit. pat. 158,695) 22.

* DYRS, W. A.: *International Handbuch der Wirtschaftskemie*. Vol. I. Published by author. Berlin-Wilmersdorf. 752 pp. M. 125. For review see *Farben-Ztg.* 26, 1393(1921).

HAUSEBRAND, E.: *Das Trocknen mit Luft und Dampf*. 5th Ed. Berlin: Jul. Springer. 185 pp. M. 42. For review see *Tonind-Ztg.* 44, 1331(1920).

THORPE, E., et al. *Dictionary of applied chemistry*. I. A—Calcium. Revised and enlarged edition. London: Longmans, Green & Co. 752 pp. 60s.

WHITE, R. PROSSER: *Occupational affections of the skin*. Revised Ed. New York: Paul B. Hoeber. 360 pp. For review see *Am. J. Med. Sci.* 161, 442(1921).

WYNNE, WALTER F. AND SPRARAGEN, WILLIAM: *Handbook of engineering mathematics*. 2nd Ed. revised and enlarged. New York: D. Van Nostrand Co. 290 pp. For review see *Mech. Eng.* 43, 148(1921).

Crystallization. NORSK HYDRO-ELEKTRISKE KVAELSTOFAKTIESELSKAB. Brit. 156-798, Jan. 7, 1921. A soln. to be crystd. is fed by a pipe on to the inner surface of an inclined rotating drum, which is cooled on the outside either by a spray of H₂O from pipes or by dipping into a bath of H₂O. The interior of the drum is provided with stationary scrapers. The crystd. mass is discharged from the open lower end of the drum into a funnel. Retarding partitions may be placed inside the drum. A suitable construction is specified.

Evaporation of liquids. J. H. AKKERMAN. Brit. 155,927, Oct. 9, 1919. *Milk* and other liquids are evapd. to dryness while spread by centrifugal force upon the surface of a rapidly rotating disk, flange or the like. The liquid may be led to the center of the disk through a hollow shaft and pipes or may be fed as a jet or spray on to the surface. The operation may be conducted with the aid of an air current or other moisture-absorbing atm. at a temp. not exceeding 40°. As the disk is not heated, the dry product may be allowed to accumulate and be removed intermittently. The disk may be of polished metal, glass, or enamelled material, and may be flat, curved, or slightly conical.

Separating gases and vapors. FARBENFABRIKEN VORM. F. Bayer & Co. Brit. 156,543, Jan. 5, 1921. See Ger. 310,092(C. A. 15, 1031).

Controlling density of solutions, etc. L. LOGAN. Brit. 156,723, Jan. 7, 1921. Means for controlling the strengths of solns. or liquid mixts. so as to maintain the sp. gr. at a const. value comprizes a device responsive to variations in the sp. gr. for operating means to control the supply of one or more constituents of the soln., etc. A suitable construction is specified.

Filtering and collecting dust from gases. J. WILSMORE. Brit. 156,998, Feb. 6, 1920. In app. embodying a series of tubular filters of canvas, gauze, metal, etc., the whole vol. of dust-laden air is directed successively along the interior of one or some of the filters at a high velocity, dislodging the dust adhering to their surfaces and forcing it into a storage chamber below; the air is then passed in the opposite direction into and through the remaining filters, which are closed at their upper ends. A suitable construction is specified.

Filtering gases. HALBERGER-HUTTE GES. Brit. 156,753, Jan. 7, 1921. In app. for the filtration of combustible gases which may contain spontaneously combustible

dust, an indifferent gas is used to scavenge the filter of any stoppage before air is admitted thereto to allow of access for cleaning; and an indifferent gas is admitted to remove the air before restarting. The indifferent gas may consist of combustion products of blast heating or boiler furnaces, and these gases may heat the gas to be filtered.

Washing and conditioning gas. HARRY BENTZ. Can. 208,917, Mar. 1, 1921. Gas is caused to impinge upon a liquid film which is flowing over a surface maintained at a temp. different from that of the gas. App. is specified.

Filtering liquids. BRADEN COPPER Co. Brit. 156,583, Dec. 23, 1920. In metallurgical and other operations where it is desired to obtain a dry filter cake, a curved filter surface is used and the cake is subjected while on the surface to the action of a gas. The curvature is such as to prevent cracks formed during drying from extending through the cake. A suitable app. is specified.

Recovering volatile solvents. H. BOLLMANN. U. S. 1,371,546, Mar. 15. See Brit. 153,044 (C. A. 15, 1049).

Fluxes or solvents for use in technical processes. ALBERT A. KELLY. Can. 209,228, Mar. 8, 1921. Sodium pentaborate is substituted for borax or boric acid in fluxes or solvents used in various processes.

Heat-insulating composition. C. H. BENNETT, J. F. PALMER AND F. V. WEDLOCK. U. S. 1,371,016, Mar. 8. A rigid, cellular heat-insulation adapted for use in refrigerator walls is formed by heating, rolling and vulcanizing a mixt. of asphalt 27, infusorial earth 11, $MgCO_3$ 5, crude rubber 26.9, S 14.9, sulfurized corn oil 2.6, petroleum tailings 5.8, $NaHCO_3$ 6 and alum 0.8 parts.

Heat-insulating sheet material. F. A. GILCREST. U. S. 1,371,753-4-5-6, Mar. 15. A heat-insulating material adapted for use as a wall-lining or for other purposes is formed of diatomaceous earth and reinforcing and retaining fabrics.

Heat-insulating materials. H. J. C. FORRESTER. Brit. 156,442, April 7, 1920. In porous stone made from "moler" and vegetable matter, which is subsequently burned out, the org. matter used is a mixt. of cork and sawdust or other substance in about equal proportions.

Insulating compositions. SIEMENS-SCHUCKERTWERKE. Brit. 156,527, Jan. 5, 1921. A plastic insulating compn. comprizes Mexican or other bitumen, cellulose derivs. such as nitrocellulose, acetylcellulose, viscose or esters of these compds., and camphor or camphor substitutes, *e. g.*, tetralin, which, however, may be omitted if the bitumen is soft. The compn. is preferably vulcanized, *e. g.*, by heating to 125° for 10 mins.

Resistor element for electric-current controllers. L. BRADLEY. U. S. 1,370,728, Mar. 8. A resistor element adapted for use in controllers carrying heavy elec. currents is formed by impregnating a solid material such as paper disks with a highly carbonaceous fluid such as a phenol-aldehyde condensation product and heating sufficiently to destroy the character of the solid material and produce a homogeneous product.

Lubricants. H. LANGER. Brit. 156,517, Jan. 5, 1921. A non-inflammable lubricant, especially suitable for cooling hot bearings, is made by emulsifying machine oil, wagon oil, cylinder oil, or other mineral oil with 2-5 times its vol. of satd. lime-water.

Lubricating oil. H. LANGER. Brit. 156,537, Jan. 5, 1921. Addition to 156,517 (preceding pat.). The manuf. of lubricants by the emulsification of mineral oils of low flash-point in clear lime water, as described in the principal patent, is modified by the use of other alk. solns. particularly K_2CO_3 soln., instead of lime water. The emulsion may be thinned if desired by the addition of cheap mineral oils.

Lubricating oils. H. PLAUSON AND J. A. VIELLE. Brit. 156,140, Dec. 31, 1920. Lubricating oils are obtained by passing a mixt. of tar oil and superheated steam through a heated tube containing a catalyst and having a constriction at the point where heat is applied. Suitable catalysts are C, silicic acid or its compds. with alk. earth metals

or heavy metals, and metals such as Fe, Al, Ni, Cu, Zn, Sn, and their alloys. Mg compds. also give exceptionally good results. In examples, mixts. of 100 parts of tar oils, which may be previously neutralized with 100–150 parts of steam superheated to 300–400° are heated to 500–900° in an Fe or ferrosilicon tube constricted by flattening to 1–3 mm. Fractional distn. of the product yields 56–80 parts of lubricating oil, together with a *turpentine substitute* and a *substance which can be used instead of benzine*.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

The meaning of the quantitative determination of ammonia in the examination of drinking water. A permanent standard solution for colorimetric estimation of ammonia in water. KIJŪRŌ FUJIWARA. Kyoto Imp. Univ., Kyoto. *Kyoto Igaku Zasshi*. (*J. Med. Sci. Kyoto*) **18**, 9–35(1921).—Free NH_3 and NH_4 salts (A), albuminoid NH_4 (B) oxygen-consuming capacity Cl, HNO_2 and HNO_3 , and number of bacilli, (C) were examd. quant. in drinking water mixed with (1) sewage (0.001 part), (2) fresh urine (0.000005), (3) fresh dung (0.000005), (4) putrified urine (0.000005), and (5) mixt. of putrified urine and dung (0.000005). It was observed that (C) and (A) increased largely in case (1); while only (A) increased in (2) and (4); in (3), (C) and (B) increased largely with little increase of (A); and in (5), (B) and (A) increased largely with little of (C). The detn. of free NH_3 and albuminoid NH_3 , therefore, has an important meaning in the examn. of drinking water. The color given by Nesslerized NH_4Cl soln. is not stable. The new standard soln. is prepd. by adding 100 cc. of cobalt soln. (1 g. $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ is dissolved in a small amt. of H_2O and 10 cc. of concd. HCl , and dild. to 100 cc. with H_2O) to 10–15 cc. ammonium picrate soln. (0.05 g. ammonium picrate is dissolved in 100 cc. H_2O). Various amts. of the mixed soln. are poured into the Nessler tubes, each being dild. to its 50 cc. mark with H_2O . Each tint of color is exactly compared with freshly prepd. Nesslerized soln. of NH_4Cl . The soln. may be kept for several months by protecting from dust. Its compn. is cobalt oxy-picrate. K. K.

Comparison of various methods of water purification. J. D. YODER. *Chem. Met. Eng.* **24**, 592–3(1921).—This is a criticism of Taylor's article (*C. A.* **15**, 911). The hot process lime-and-soda water softener not only gives a softer water than the cold lime-and-soda treatment and very little harder than the zeolite process but also furnishes a hot boiler feed water. It reduces the total solids to a minimum and keeps the concn. of the Na salts as low as possible in the boiler, thereby reducing the tendency for foaming and priming. C. C. BAKER

Detection of nitrites and of nitrates in water. A. ESCAÏCH. Paris. *Ann. chim. anal. chim. appl.* **3**, 56–7(1921).—See *C. A.* **12**, 2637; **14**, 3039. C. C. DAVIS

The rapid determination of the composition of mineral waters. FERREIRA DA SILVA. *Rev. chim. applicada* **4**, 191–4(1919).—The detn. of total and permanent hardness, alkalinity, chlorides, and nitrates is sufficient for medical purposes. Rapid volumetric and colorimetric methods are described. C. B. SLAWSON

Soap solutions for determination of hardness. A. KRIEGER. *Chem. Ztg.* **45**, 172–73(1921).—The confusion resulting from the use of several arbitrary hydrometer scales in industrial practice leads to criticism of the methods commonly used in stating water hardness. K. points out that hardness is reported in terms of CaO and CaCO_3 , a cause for much confusion in the interpretation of results. Modifications are suggested for the Clark and Boutron, and Boudet methods, with a view to the establishment of one standard method. Following Boutron and Boudet, a soap soln. ten times the strength of Clark's is recommended as being more rapid for plant work. J. T. R. ANDREWS

The swimming pool. JACK J. HINMAN, JR. *Am. Physical Education Rev.* **25**,

No. 9, Dec. 1920.—The number of infections due to swimming pools is possibly over-estimated, but unless pools kept in proper condition they may be dangerous to public health. While refiltration of the pool water is economical it is not satisfactory unless germicides are used. CuSO_4 used either alone or with Cl or calcium hypochlorite have given satisfactory results at the State Univ. of Iowa, while Cl alone gave excellent results. Tables and a comprehensive bibliography are given. G. C. BAKER

PORTER, J. EDWARD: *The Activated Sludge Process of Sewage Treatment*. With brief abstracts, patents, new items, etc. Compiled mainly from current literature. 2nd Ed. Rochester, N. Y.: General Filtration Co. 117 pp. \$1.

Water-treating apparatus. J. ROCHÉ and L. J. PARKER. Can. 210,023, Apr. 5, 1921. The app. comprizes a container including annular body portions secured together, elec. conducting perforate partitions dividing the container into compartments which contain water-treating materials and means for connecting alternate partitions in an elec. circuit. The inner walls of the container may be glazed to prevent foreign material from rigidly adhering to them and means is provided for discharging foreign material which accumulates in the container.

Softening of water. ROBERT GANS. Can. 210,230, Apr. 5, 1921. Reissue of No. 135,092, Aug. 2, 1911. Water is softened by passing it through zeolites. The zeolites are regenerated by passing a soln. of NaCl through them.

Apparatus for separating detergents from water. ARTHUR D. SMITH. Can. 210,374, Apr. 12, 1921. Structural features are specified for an app. for electrically removing soap or other detergent from water.

Water-purifying apparatus. J. ROCHÉ and R. J. PARKER. U. S. 1,371,814, Mar. 15. The app. is arranged with filters composed of C and quartz and connections for elec. treatment.

Distilling water. H. G. C. FAIRWEATHER. Brit. 156,450, April 27, 1920. H_2O which has been used for cooling purposes in an internal-combustion engine, steam engine, etc., is sprayed down a scrubber up which a current of air is forced through a pipe. The air passes from the top of the scrubber to a condenser. The condensed H_2O collects in the base and the air passes by a pipe to the atm. or to an exhaust pipe. As supplied to an internal-combustion engine, cold H_2O is forced by a pump through a pipe, the condenser, the pipe, the jacket of the silencer and thence to the distributor of the scrubber. The crank case of the engine may be used as a pump to draw air through the scrubber and condenser.

Composition for removing incrustation from boilers, etc. J. URRUTY. U. S. 1,371,584, Mar. 15. A disincrustant for cleaning boilers and condensers is formed of HCl 50, CuSO_4 2.5, NaHCO_3 0.5, KCN 0.5 and H_2O 46.5%.

Device for purifying sewage by agitation and aeration. J. P. BALL. U. S. 1,371-406, Mar. 15. The device is adapted for attachment to a sewage pipe line.

Garbage- and refuse-disposal plant. H. LAMMERTZ. U. S. reissue 15,059, Mar. 8.

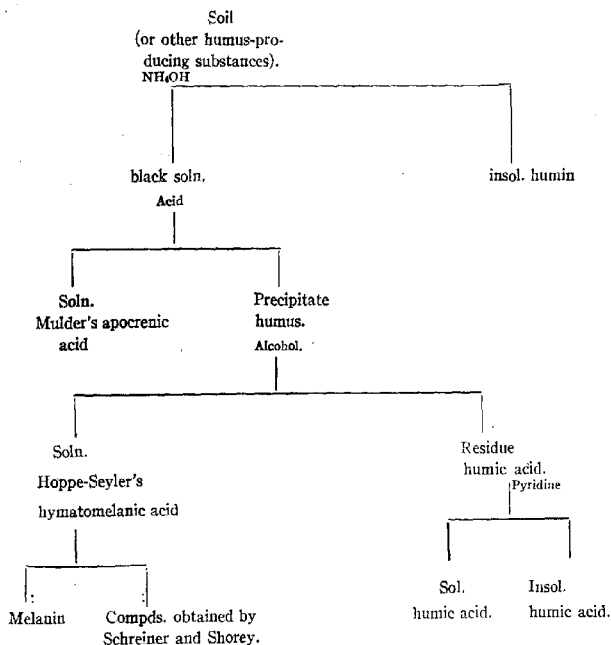
15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

The formation of humus. V. A. BECKLEY. *J. Agr. Sci.* **11**, 69-77(1921).—A study of the formation of humus in the lab. and its natural formation in the soil. Evidence was obtained which shows that the formation under both conditions proceeds in 2 stages: "Carbohydrates react with acids (whether mineral or amino acids) to produce hydroxymethylfurfural; hydroxymethylfurfural condenses to form humus. In addition, in the lab., there is produced some furfural and levulinic acid. No evidence

of the formation of hydroxymethylfurfural during the decompn. of cellulose by *Spirochaeta cytophaga* could be obtained." R. B. DEEMER

The preparation and fractionation of humic acid. V. A. BECKLEY. *J. Agr. Sci.* 11, 66-8(1921).—B. extd. and fractionated humus from soil, rotted straw and sugar according to the following scheme:



R. B. DEEMER

Studies on soil reaction. I. E. A. FISHER. *J. Agr. Sci.* 11, 19-44(1921).—This is a complete and thorough review of the theories of soil acidity and a critical presentation of methods for the measurement of soil reaction. II. *Ibid* 45-65.—This is largely a duplication of work already begun upon the electrometric and colorimetric methods of detg. H-ion concn., and the application of these methods to the measurement of soil acidity. F. extends this work somewhat by attempting the detn. of lime requirements as well as reaction alone. Emphasis is stressed upon the effect of fineness of division on measurement of H-ion concn. of soils, little attention having been given to this point previously.

R. B. DEEMER

Test for soil acidity. J. A. BROCK. *Facts About Sugar* 12, 292-3(1921).—A discussion of the common methods for the detn. of soil acidity is presented. The Truog method should be regarded as the surest in detg. the presence of acid conditions.

N. Kopeloff.

Rapid dry combustion method for the simultaneous determination of soil organic matter and organic carbon. J. W. READ. *J. Ind. Eng. Chem.* 13, 305-7(1921).—

Digest 1 g. of soil 6 times with 30 cc. water and 10 cc. each of 2.5% HCl and HF. After each digestion decant the soln. through a perforated combustion boat contg. an asbestos mat. Dry for 16 hrs. at 99°, weigh the organic residue and det. its C content by combustion.

W. T. H.

A preliminary investigation into the occurrence of different kinds of carbonates in certain soils. F. HARDY. *J. Agr. Sci.* 11, 1-18(1921).—The Fenland silts and soils derived from them were studied to det. the behavior of dolomite therein towards weak soil acids, as compared with CaCO_3 . Culture expts. on nitrification established to some extent the fact that dolomite modifies the biol. changes in these soils. H. uses the term "calcitoid" and "dolomitoid" carbonate, the former to indicate the easily decompd. carbonate; and the latter, the more stable carbonate. A method for their approx. detn. was elaborated and is given in detail.

R. B. DEEMER

The gases of swamp rice soils. V. A methane-oxidizing bacterium from rice soils. P. A. SUBRAMANIA AIYER. *Mem. Dept. Agr. India. Chem. Ser.* 5, No. 7, 177-80(1920).—*B. fluorescens liquefaciens* was identified as the bacterium responsible for the oxidation of methane at the surface of swamp paddy soils. The oxidation of methane is optimum when the bacterium is propagated on purely mineral media. In the presence of small amts. of org. matter the oxidation is appreciable but slow; with large amts. of org. matter the oxidation is reduced to a minimum. VI. Carbon dioxide and hydrogen in relation to rice soils. W. H. HARRISON. *Ibid.* No. 8, 181-94.—Expts. made show that if CO_2 and H are generated in paddy soils they disappear rapidly and cannot exist in association under paddy soil conditions. This condition is accounted for by the fact that a bacterial action takes place resulting in the reduction of the CO_2 by the H and the formation of org. matter and even marsh gas.

J. J. SKINNER

Investigation of the soil and bagger soil tests in marshes and lakes of the Utrecht Vecht, together with the plans for reclamation of these lakes. A contribution to the knowledge of the chemical composition of lowland moor soils. D. J. HISSINK. *Verslag. v. Landbouwkundige Onderzoek. de Rijkslandbouwproefstat.* 1920, No. 24, 1-143.—Expts. to det. whether the bagger and lowland soils were of sufficient depth to form an adequate layer of soil and secondly whether they were sufficiently fertile. Tables containing complete chem. and phys. analyses are presented. The soils have little if any CaCO_3 . In comparison with other lowland soils the P content was not high. They possess a favorable N content. Considerable amts. of S are present but by proper methods of oxidation and in the presence of sufficient Mg and lime the danger of undue acidity may be overcome. H. concluded that a depth of soil of 5 decimeters can be obtained; this is considered adequate. Therefore he recommends the reclamation of these lands.

N. KOPELOFF

Representative Transvaal soils. I. The Koedoespoort red loam. B. DE C. MARCHAND. *J. Dept. Agr., Union S Africa* 1, 722-7(1920).—The chem. compn. of a number of soils of this type is given. The soils are characterized by a high % of Fe and Al. The soils respond to phosphate fertilizer, especially basic slag. K and N do not give increasing production.

J. J. SKINNER

The agriculture and soils of the Cape Province. I. Witkop-Burgersdorp. ARTHUR STEAD. *J. Dept. Agr., Union S. Africa* 1, 660-70, 819-28(1920); cf. *C. A.* 14, 3741.—The mechanical and chem. analyses of a number of soils of the province are given.

J. J. SKINNER

Investigation on adsorption phenomena in soils. VI. Method for the determination of the exchangeable bases held by adsorption in the soil and the significance of these bases for soil processes. D. J. HISSINK. *Verslag. v. Landbouwkundige Onderzoek. der Rijkslandbouwproefstat.* 1920, No. 24, 144-250.—The purpose of this investigation is to det. the bases held by adsorption in the soil as well as their properties with regard to other bases held in soln. and the exchange which occurs. The method

used is as follows: 25 g. of soil in a beaker are covered with about 100 cc. of warm *N* NaCl soln. It is shaken occasionally and allowed to stand overnight. The supernatant liquid is decanted through filter paper into a liter flask and the entire vol. of soil is then transferred to the filter paper and further leached. If the liquid is turbid it is filtered again. When the liter flask is full, the funnel is placed over another liter flask and the soil leached with *N* NaCl soln. until the flask is full. The Ca content in both solns. is then detd., the difference between the first and second liters representing the content of exchangeable Ca. In the same manner one can det. the amt. of adsorptively held Mg, but this can best be carried out as in the second method. The second liter contains only very minute traces of Mg, and the second liter from soils which contain no CaCO₃ are practically Ca-free. The second method for the detn. of adsorptively held Mg, K and Na is identical with the method just described except that a *N* soln. of NH₄Cl is used twice to leach $\frac{1}{2}$ liter. These methods were used on a large variety of soils. The conclusions arrived at concerning the soil processes are as follows: The small amts. of K held by adsorption, which averaged 0.024%, is of far greater significance for plant nutrition than the 0.826% acid-sol. K. The satn. of the soil is related to the content of the adsorptively held bases. Furthermore, the colloidal chem. equil. of the soil controls the relation between the bivalent and univalent cations held by adsorption. The importance of the exchangeable bases or those held by adsorption is far greater for soil processes than the acid-sol. bases.

N. KOPELOFF

Some effects of potassium salts on soils. R. S. SMITH. Cornell Agr. Expt. Sta., *Memoir* 35, 571-602(1920).—A report of pot and water-culture work, together with a review of the literature.

R. F. GARDINER

Building up the fertility of the soil. A. BAGULEY. *J. Dept. Agr. Union S. Africa* 1, 755-9(1920).—A general discussion of the effects of fertilizers on soil fertility.

J. J. SKINNER

Calcium cyanamide. Its agricultural use as a fertilizer. C. F. JURITZ. *J. Dept. Agr. Union S. Africa* 1, 765-9(1920).—A discussion of expts. made with cyanamide, pointing out conditions under which dicyanodiamide is formed in mixed fertilizers and its harmful action. It is concluded that if proper care in storage is practiced no bad effects are to be feared.

J. J. SKINNER

Combined sprays for controlling insect pests and fungous diseases. E. MACKINNON. *Sci. Ind. (Australia)* 2, 718-31(1920).—Chemicals for combined sprays can be mixed safely as follows: (1) arsenate of lead and lime sulfur; (2) arsenate of lead and bordeaux; (3) nicotine and lime sulfur; (4) nicotine and bordeaux; (5) arsenate of lead and nicotine; (6) arsenate of lead, nicotine and lime sulfur; (7) arsenate of lime, nicotine and bordeaux; (8) soap and nicotine; (9) soap and polysulfide; (10) soap, ammonium polysulfide and nicotine. A discussion of each mixt. is given.

J. J. SKINNER

Utilization of hydrochloric acid (HACKL) 18. Solvents for phosgene (use as agricultural poison) (BASKERVILLE, COHEN) 2.

Modern Manufacture of chemical manures. London: Sturtevant Engineering Co., Ltd. 85 pp. 12s. 6d.

WOOD, T. B.: **The chemistry of crop production.** London: University Tutorial Press. 5s. 6d. net. For review see *J. Ministry Agr.* 27, 1083(1921).

Fertilizers. W. J. MELLERSH-JACKSON. Brit. 158,444, April 14, 1920. A fertilizer is obtained from the waste liquor from the CaO process of treating hides by sepg. the liquor into a sludge and an effluent, pptg. the proteins in the effluent by treatment with waste liquor from the tanning process as described in 123,974 (C. A. 13, 1651)

and heating the pptd. matter to dryness with the sludge previously obtained from the lime liquor or with caustic alkali or with other sludge containing caustic alkali. Soda ash, potash, or other alkali carbonate may be added before heating. Part of the moisture may be removed from the sludges before admixt.

Phosphates. H. PLAUSON and J. A. VIELLE. *Brit.* 156,124, Dec. 30, 1920. Phosphates are rendered assimilable, as a fertilizer, by grinding them with a large quantity of H_2O to which has preferably been added a small amt. of acid or alkali. The finely divided phosphate becomes hydrated and assumes a colloidal form which after drying is equal in value to water-sol. phosphates. The addition of 0.1 to 3% of H_2SO_4 , HNO_3 , or H_3PO_4 is sufficient to accelerate this transformation considerably. The process is facilitated by conducting it under pressure or by heating to about 90-95°, or by adding protective colloids such as tannin, salts of lysalbinic acid, or the alkali salts of humic acid. Bone-meal and guano may be subjected to the same process. In an example a slag phosphate is first ground in a phosphate mill and is then disintegrated in the presence of 6 times its amt. of H_2O . The resulting suspension is weakly acidified with a gaseous or liquid acid and allowed to sep. into two layers. The bottom layer of phosphate mud is withdrawn, filtered and dried; preferably by blowing with hot air or by heating with waste gases.

16—THE FERMENTATION INDUSTRIES

H. S. PAINE

The conversion of tropical fruits into wine. R. FIGUE. *Bull. assoc. chim. sucr. dist.* 38, 105-13 (1920).—A review is given of the ancient and modern manuf. of beverages from diverse sources. The purpose of the paper is to indicate methods of making beverages from the fruits of the French colonies. All the fruits collected for domestic use may be used and the acidity regulated by dilg. and sweetening or by the addition of tartaric or citric acid or lemon juice. The must is best prepd. by maceration since it is cheaper and involves less installation. The fruit is cut in pieces and covered with water in 7 casks of 120 l. capacity with false bottoms. The extn. is successive, pure water being added to no. 1 and in 20 min. drawn off and added to no. 2 etc. to the 6th, each cask being extd. 6 times. The juice has a density about 1% less than pressed juice. A juice of sp. gr. 1.050 gave an av. of 6% EtOH and one of 1.070 gave 9%. A soln. of ammonium glycerophosphate satd. with SO_2 was used to prevent spontaneous fermentation during maceration. Com. yeasts were used. The barm should be prepd. 2 or 3 days before the must by adding 1 kg. white sugar, 20 g. tartaric acid, and 20 g. nutrient salts to 10 l. water-boiling 20 min. and cooling to 30°; then the yeast is added. It is generally necessary to add sugar to the juice. Some nutrient salts should be added. This can be done by adding about 80 g. to each macerator or 100 g. per 100 l. wine to the sugar sirup. One l. of barm is used to each 100 l. of juice. After effervescence ceases 10 g. tannin is added in soln. and after 8 days the wine is drawn off into casks fumigated with SO_2 .

I. D. GARARD

Iodometric determination of the diastatic power of malts. JULIAN L. BAKER and HENRY F. E. HULTON. *Analyst* 46, 90-3 (1921).—The method of A. R. Ling (*C. A.* 5, 562) for detg. the diastatic value of malts, which depends on the CuO -reducing power exhibited when they act on sol. starch, presents some difficulties to those unaccustomed to use it. Since maltose is oxidized quant. to maltobionic acid by I in the presence of NaOH, the diastatic capacity of malt exts. may be detd. iodometrically. One cc. of 0.1 N I, equals 0.017 g. of maltose. The following method is proposed: As in Ling's method, allow 1, 2 or 3 cc. of ext. to act 1 hr. at 21° on 100 cc. of 2% sol. starch. Stop the action by adding 10 cc. of 0.1 N NaOH and dil. to 200 cc. For the titration take 50 cc. of this soln., add 20 cc. of 0.1 N I soln. and 30 cc. of 0.1 N NaOH. Allow

to stand 10 min. at air temp., acidify with 4 cc. of 0.1 N H_2SO_4 and titrate excess I with 0.05 N $Na_2S_2O_4$. The diastatic capacity D. P. = $6.7 Y/X$ where Y = cc. of 0.1 N I used in oxidizing the maltose, and X = cc. of 5% malt ext. originally taken for conversion. The reducing power $R = 3.4 Y$; and it is evident if $Y > 10$, $R > 34$. A table is given showing R , and percentage fall in D. P. which indicates the importance of keeping below the limit $R = 34$ because of the rapid fall in the D. P. near this point. Comparison of the D. P. of various malts as detd. by the Ling and by the proposed method indicate satisfactory agreement; a table is given. It is claimed for the method that it is more accurate than Ling's, as no external indicator is needed, and also that it can be carried out by artificial light.

H. S. BAILEY

Solvents produced by bacteria. H. E. HALL. *Chem. Age* (N. Y.) 29, 103-4 (1921).—A description of the Weizmann process for the production of acetone. The bacteria are isolated from soil, and cereals, maize, rice, flax, etc. and work successfully under both aerobic and anaerobic conditions. The process comprises four stages: production of the sterile, thoroughly cooked mash, production of the seed or pure culture, fermentation, and sepn. of the acetone, $BuOH$ and $EtOH$ by distn. 56% of the total solvents is $BuOH$, 32% acetone, and 12% $EtOH$. Each bushel of corn yields approx. 10 lbs. (4.532 kg.) of these solvents. Properties and derivs. of *butyl alcohol* are given and their solvent properties discussed. *Diacetone alcohol* and *isopropyl alcohol* are new solvents offering promise. The advisability of purchasing pyroxylin solns. and dopes on specifications is emphasized by analytical results that show adulteration with cheaper materials.

W. H. BOYNTON

Determination of small quantities of iron in organic liquids (MALVEZIN, RIVALLAND) 7
Determination of methanol in sulfite alcohol (SEIBER) 7.

MEISSNER, RICH.: *Technische Betriebskontrolle im Weinfach*. Stuttgart: Verlag Eugen Ulmer. M58. For review see *Chem. Ztg.* 45, 9 (1921).

PAWLOWSKI, F.: *Die brautechnischen Untersuchungsmethoden*. 2nd Ed. Edited by Doemens. München: R. Oldenbourg. 248 pp. M33, bound M37. For review see *Chem. Weekblad* 17, 685 (1920).

Acetic and butyric acids from marine algae. L. DUPONT. U. S. 1,371,611, Mar. 15. Fresh algae 100 kg. are treated at 35° with earth fertilized with sea-wrack and fermentation is allowed to proceed. A slightly alk. reaction is maintained by the addition of Na_2CO_3 . At the conclusion of the fermentation, the soln. is sepd. from solid residue, acidified with HCl or H_2SO_4 and the liberated org. acids are distd. A yield of 80 kg. $HOAc$ and 40 kg. butyric acid may be obtained. I and K salts are obtained from the residue.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Identification of sulfonal and trional. W. ZIMMERMANN. *Apoth. Ztg.* 35, 27 (1920); *J. Chem. Soc.* 118, 11, 779-80.—Sulfonal m. $125-6^\circ$; trional m. 76° . When 0.1 g. of either is heated in a test tube with 0.1 g. Na salicylate, an odor of mercaptan develops; if the mixt. is treated with 5 drops of alc. and 5 drops of concd. H_2SO_4 and after 5 mins., heated with the addition of a further 5 drops of H_2SO_4 , a turbid red soln. is obtained, having the odor of Me salicylate. A violet-colored residue is obtained when a mixt. of 0.2 g. of sulfonal or trional and 0.2 g. of Na salicylate is ignited in a porcelain basin; this residue gives a violet soln. with a drop of H_2O . The addition of a drop of dil. HCl changes the color to yellow, a brown flocculent ppt. separates and SO_2 escapes. Ac .

tanilide, antipyrine and phenacetin yield black residues when heated with Na salicylate, veronal gives a green residue, and santonin a red residue. W. O. E.

Medicinal plant culture in Austria. W. HIMMELBAUR. *Pharm. Monatsh.* 2, 3-8(1921).—A brief account of the progress made during the last 10 years, including a bibliography of the subject. W. O. E.

A reaction of American wormseed oil. A. LANGER. *Pharm. Ztg.* 66, 191(1921).—The ascaridol constituent of wormseed oil reacts with phenolphthalein in the proportion of 1 to 3 (in the case of an oil containing 65% ascaridol) to form a reddish yellow, almost tasteless resin, readily sol. in CHCl_3 , alc., Et_2O , dil. alc., partially sol. also in aq. solns. of alkalis and carbonates, with a red color, moderately sol. in boiling toluene or benzene, difficultly sol. in xylene, petr. ether and CCl_4 . The compn. is as yet undetd. It possesses the character of a dye. The reaction may be used in the evaluation of wormseed oil. W. O. E.

Some Australian essential oils. J. K. BLOGG. *Science & Ind.* (Australia) 2, 742-5 (1920).—A commentary on some of the more important essential oils as export commodities. The most valuable essential oil which can be produced in Australia without special cultivation is that from *Backhousia citriodora*, native of Queensland. This oil is the most prolific of citral of any known variety, consisting as it does almost entirely of citral, which constitutes the element or flavor contained in the essential oil of lemon, and is, therefore, largely used by distillers of inferior oil of lemon to raise the citral content of their product. Its chief use, however, is found in the manuf. of perfumery, and since the discovery of a process for converting it into ionone (a trace of which is capable of filling a large room with the intense odor of violets), it is very largely employed for that purpose. B. describes 2 procedures for isolating citral from the essential oil, namely by the bisulfate method and distn.; operations are likewise indicated for its condensation and conversion to ionone. Other Australian oils mentioned which contain citral are obtained from *Eucalyptus slageriana* and *Leptospermum liveridgei*. Still another oil possessing exportable value is derived from *Eucalyptus macarthuri*, and contains as chief constituent geranyl acetate, a product capable of yielding geraniol and rhodinol, the latter being one of the main constituents of attar of rose. *Eucalyptus citriodora* or "citron-scented gum" yields an oil containing 80 to 90% citronellal, a substance easy of reduction to citronellol, a very important constituent of attar of rose. W. O. E.

Formaldehyde soap solution. D. V. O. *Olien en Vetten* 5, 432-4(1921).—A review, in which the prepn., use, efficiency as a disinfectant, and analysis of formaldehyde soap soln. (a soln. of K soap in formalin) is considered. References are given.

NATHAN VAN PATTEN

Action of hydrogen acids on essence of *Juniperus oxycedrus*: Hydrochloride, hydrobromide, hydroiodide compounds of cadinene. R. HUERRE. *J. pharm. chim.* 23, 21-9(1921).—By mixing oil of cade (50 g.) distd. by H. (C. A. 13, 1369), with glacial AcOH (150 g.) previously satd. with dry HCl, HBr or HI gas, crystals were formed of the *2HCl*, *2HBr* and *2HI* compds. of *l*-cadinene. With the same sample of oil, the HI compd. gave much higher yields than the HCl or the HBr compds., *e. g.*, 54% and 69% against 7.2-14% (HCl-) and 24% (HBr compd.). The max. and av. yields of cadinene calcd. from $\text{C}_{15}\text{H}_{24}$. 2HI are resp. 30.59% and 21.11%. S. WALDBOTT

Use of different precipitating agents in the preparation of emulsins of almonds. M. BRIDEL and R. ARNOLD. *J. pharm. chim.* 23, 161-8(1921).—"Ethylic," "methylic" and "acetic" emulsins were prepd. by Hérissay's process (1899; cf. C. A. 11, 2819), *i. e.*, pptg. an aq. macerate of sweet almonds first with AcOH to eliminate casein, then with, resp., 95% EtOH, MeOH and acetone. Before sepg. the ppts., they were left in contact with the fluids resp. for 48, 31 and 28 hrs. The activities of the 3 emulsins in dried form were then compared in regard to the specific reactions of their enzymes:

β -glucosidase (A), β -galactosidase (B), lactase, gentiobiase, cellobiase and invertase, either from the hydrolytic, or synthetic, or both points of view. As a rule, there is little or no difference in the activities of the 3 emulsins. In (A), the difference in speed of hydrolysis by the 3 emulsins acting on amygdalin (2 hrs.), salicin (6 hrs.), β -benzylglucoside (17 hrs.) and β -methylglucoside (7 days) is notable. Pptn. by acetone has lessened the hydrolytic and synthetic activity of B, confirming Mougne (*Thesis* 1918) who has shown that B is destroyed when emulsin is left in contact with 80% acetone at 38–40° for 16 days. When emulsin is covered with MeOH for 96 hrs. at 22–25°, the activity of its lactase is reduced to 30.64%, that of invertase to traces. (cf. C. A. 8, 2553; 15, 1032.) S. WALDBOTT

Determination of borneol and its alkyl derivatives by acetylation. FÉLIX MARTIN. *J. pharm. chim.* 23, 168–71 (1921).—Upon an exptl. study of J. de Montgolfier's method (*Ann. chim. phys.* [5] 14, 46–50), M. finds that a 100% yield is obtained by heating borneol or an alkyl deriv. of borneol with 3 times its wt. of Ac_2O for 3 hrs. to 145–150°. S. WALDBOTT

A new hemostatic: Polygonum hydropiper. PH. JAN MUSZYŃSKI. Warsaw. *Pharm. J.* 106, 269–70 (1921).—This plant has been a household remedy with the Russian peasants to stop bleeding, and was suggested by Piotrowski (1912) as a possible substitute for hydrastis or ergot. A. Favitzki and A. Lebedieff showed the fluid ext. to be an excellent hemostatic in all cases of internal hemorrhage, and also to have a sedative effect. L. Kaminska (1914) obtained success with it in cases where hydrastis and ergot had failed. The fluid ext. is prepd. from the powdered plant by percolation with 60–70% EtOH. S. WALDBOTT

The chemistry of terpenes and essential oils (FRÈRE) 10. Electrometric titration of alkaloids and their salts (KOLTHOFF) 7. Examination of neosarsphenamine (MACALLUM) 10. Urethans of thymol and carvacrol (SHERK) 10.

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Schlickum, H. Telle and H. Trunkel. Leipzig: J. A. Barth. 928 pp. M140, bound M160. For review see *Pharm. Weekblad* 58, 197(1921).

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Antiseptics. F. S. MARDON. *Brit.* 156,209, Jan. 3, 1921. See U. S. 1,358,227 (C. A. 15, 412).

Ointments. L. HALL. *Brit.* 156,964, Nov. 18, 1919. An ointment is prepd. by heating a mixt. of neatsfoot oil, white wax, PbO, and PbCO₃, and then adding H₂BO₃. The mixt. is further heated and then stirred until cold.

Colloidal solutions; emulsions; disinfectants; medicants. L. LILIENFELD. *Brit.* 156,725, Jan. 7, 1921. Solns. of alkyl and aralkyl ethers of cellulose, starch, dextrin, etc., are used as protective colloids in the prepn. of colloidal solns. and emulsions, *e. g.*, of alkaloids, camphor, oils, phenol, disinfectants, medicaments, cosmetics, salves for external and internal use, liniments, and injections. The colloid may be formed in the soln. of the cellulose ether, etc., for instance, by reduction or elec. atomizing, or it may be added in the dry state or in soln.; and other protective colloids may be added. Numerous examples are given.

Thioglycolates. CHEMISCHE FABRIK FLORA. *Brit.* 156,103, Dec. 29, 1920. An aq. soln. of thioglycolic acid is treated successively with an aq. soln. of a Ag salt and one of NaOH; or the Ag soln., *e. g.*, AgNO₃ or Ag₂F₂, may be added to the thioglycolic acid dissolved in NaOH. By addition of alc., Ag thioglycolate of Na, AgSCH₂COONa, is pptd. as a yellow powder, which is sol. in H₂O and is of value in treating diseases due to gonococci.

Calcium iodide preparations. W. SPIEZ. *Brit.* 155,781, Dec. 23, 1920. Comps. of CaI₂ with neutral org. derivs. of NH₃ are prepd. by mixing aq. or alc. solns. of the iodide and of the org. substance and allowing crystn. to take place; if necessary the mixt. may be first refluxed or evapd. Examples are given of the prepn. of comps. of CaI₂ with glycocoll, glycylglycine, alanine, urea, and ethyl urethan. The products are not deliquescent nor affected by CO₂. They are intended for therapeutic use.

Alkaloids. C. H. BOEHRINGER SOHN. *Brit.* 156,190, Jan. 3, 1921. α -Lobeline, the physiologically active alkaloid of *Lobelia inflata*, is isolated from the HCl soln. of the plant ext. by fractional decompn. with alkali. According to an example, weakly basic colored impurities are first removed from the acid soln. of the ext. by addition of a little NaOH soln. and extn. with ether. The greater part of the α -lobeline is then obtained in a cryst. condition by further action of alkali and ether followed by evapn. of the latter. From the residual liquid further small fractions of the alkaloid may be obtained in the same way, resinous bases being eliminated from the ethereal solns. by partial neutralization with HCl.

Preserving formaldehyde products. O. J. BERG. U. S. 1,371,724, Mar. 15. A

preserving layer containing glycerol, which also may contain NH_4 stearate and stearic acid, is used for preserving CH_3O compns. such as polymerized CH_3O in fumigating devices.

Compounds of metals with albumins. K. KOTTMANN. U. S. 1,371,380, Mar. 15. Compds. of Cu, Hg, Cr, Ag, Au, or Fe with albuminous derivs. of modified human or animal organs or tissues such as tuberculous or syphilitic tissues, carcinomas or placentas are prepd. for use as therapeutic agents or to diagnose pathological conditions or physiological alterations due to pregnancy. Numerous examples are given. U. S. 1,371,381 relates to similar products prepd. from ninhydrin-free materials to avoid deleterious secondary physiological effects.

Soluble gold. J. ISHIKAWA. Japan 35,932, March 9, 1920. Au 10 g. is dissolved in aqua regia, balsam sulfide 38.5 g. is added, the mixt. is heated on a water bath, washed with H_2O , evapd. to dryness and mixed with Rh-Pt-, SnS-, Cr-, U-, and Bi-resinates and dissolved in a mixt. of lavender oil 200 g., rosemary oil 100 g. and $\text{C}_6\text{H}_5\text{NO}_2$ 100 g.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

A process for the utilization of hydrochloric acid. HEINRICH HACKL. *Chem. Ztg.* 45, 149-50 (1921).—A possible process for consuming the large surplus of HCl resulting from the manuf. of Na_2SO_4 may be in the decompn. of raw phosphate. This reaction can not be carried out in the usual manner of prepg. superphosphate with H_2SO_4 , principally because the concd. HCl cannot be even approx. neutralized by the phosphate, and also because the CaCl_2 formed is so hygroscopic as to require artificial drying. If, however, the phosphate in finely ground condition is treated with dil. HCl until approx. neutrality, and milk of lime added, the P_2O_5 can be pptd. from the CaCl_2 soln. as dicalcium phosphate. This material after pressing contains 24% citrate-sol. P_2O_5 and by mixing it with gypsum this P_2O_5 content is lowered to the com. standard and at the same time the moisture content is so far reduced that artificial drying is unnecessary. The process has an important economic aspect, since it permits H_2SO_4 to be used in prepg. the Na_2SO_4 needed by the glass industries and utilizes the by-product HCl to prepare a fertilizer needed by agriculture.

SIDNEY D. KIRKPATRICK

Tower packing efficiencies. E. L. JORGENSEN. *Chem. Met. Eng.* 24, 741-2 (1921).—Although Glover and Gay-Lussac towers demand 25-40% of the total capital invested in H_2SO_4 plants (\$120,000,000 in U. S.), the packing, on which their efficiency depends, represents only 5-8%. Mathematical analysis shows that the efficiency of present packing in active surface and uniformity of gas passages can be greatly increased, and sketches are given of suitable interlocking devices for accomplishing this desideratum.

JEROME ALEXANDER

Recovery of alkali from sodium sulfate. LATEX. *Chem. Trade J.* 68, 136 (1921).—L. describes a process for the production of Na_2CO_3 from a by-product Na_2SO_4 soln. The reactions in the process are: (1) $\text{Ca}(\text{OH})_2 + 2\text{C}_6\text{H}_5\text{OH} = (\text{C}_6\text{H}_5\text{O})_2\text{Ca} + 2\text{H}_2\text{O}$; (2) $\text{Na}_2\text{SO}_4 + (\text{C}_6\text{H}_5\text{O})_2\text{Ca} = 2\text{C}_6\text{H}_5\text{ONa} + \text{CaSO}_4$; (3) $2\text{C}_6\text{H}_5\text{ONa} + \text{CO}_2 + \text{H}_2\text{O} = 2\text{C}_6\text{H}_5\text{OH} + \text{Na}_2\text{CO}_3$. The process is recommended for works that are equipped to convert the recovered Na_2CO_3 into NaOH and that can use the latter for purposes that do not require a high-grade NaOH. A cheap supply of lime and phenol should be available. Phenol is recovered at a slight loss.

E. S. WHITTIER

Salts-refining plants at Owens and Searles Lakes. L. W. CHAPMAN. *Chem. Met. Eng.* 24, 693-8 (1921).—Report of a recent survey of plants producing natural soda ash, borates and potash in the Owens and Searles Lake District of California. After a brief geological discussion the following plants are described: Inyo Devel't. Co.,

Natural Soda Products Co., California Alkali Co., Am. Trona Corp., Solvay Process Co., West End Chem. Co., Burnham Process (solar evaporation in ponds).

JEROME ALEXANDER

Removal of arsenic from zinc electrolyte by means of hydrogen sulfide. HERBERT R. HANLEY. *Chem. Met. Eng.* **24**, 693-6(1921).—The slime resulting from collecting arsenical zinc-fume in water is dissolved in dil. H_2SO_4 and treated with SO_2 to reduce to trivalent state any As that has become quinquevalent by oxidation. The As is then mostly pptd. out by H_2S in a soln. containing not less than 10 g. per l. of H_2SO_4 (to avoid pptn. of ZnS). The remaining As (about 1 g. per l.) is "removed by pptn. as an Fe-As compd. from a soln. containing Fe in excess of the amt. required to form this compd., the pptg. agent being pulverized lime rock. This operation also results in the complete removal of the iron." After the removal of Cd, etc., as usual, electrolysis gives excellent Zn cathodes. Detailed description and illustration are given of a large scale app. for generation and use of H_2S , the raw materials being low-grade material containing much FeS + dil. H_2SO_4 . The sulfur-oil method of making H_2S is also discussed.

JEROME ALEXANDER

The effect of alkalinity on the use of hypochlorites. E. K. RIDEAL AND U. R. EVANS. *J. Soc. Chem. Ind.* **40**, 64-6R(1921).—Hypochlorites are largely used for bleaching, sterilization of water, treatment for "textile finishing" to prevent growth of algae and consequent stains, for water in swimming baths, and $Ca(OCl)_2$ as a deodorizer, as a drain cleanser and as a disinfectant. $Ca(OCl)_2$ is very unstable, while $NaClO$ is much more satisfactory as a source of hypochlorite if kept cool, protected from light and tightly sealed. Liquid Cl possesses an advantage in the fact that two acid products are formed when it is dissolved in water, one being a strong oxidizing agent.

W. H. BOYNTON

Recovery of potash alum and sulfur at Tonopah. L. DUNCAN. *Chem. Met. Eng.* **24**, 529-30(1921).—The sepn. of potash alum from ore containing: $K_2Al_2(SO_4)_2 \cdot 24H_2O$ 20, S(free) 15, SiO_2 58.8, Al_2O_3 2.6, $CaSO_4$ 2.1, $CaCO_3$ 1.2, and Fe_2O_3 0.3% is affected by dissolving in hot water and crystg. by cooling. The capacity is about 10 tons (4532 kg.) of c. p. alum and 10 tons 85% S concentrates per day. A flow sheet is given.

W. H. BOYNTON

The manufacture of chlorine. A. KOEHLER. *La nature* **47**, II, No. 2374, 199-203 (1919).—Description of plant practice in a French plant.

C. R. PARK

BEHR, JOH.: *Der deutsche graphit und seine wirtschaftliche bedeutung.* Berlin: Verein deutscher giesereifachleute E. V. 23 pp. M5. For review see *Tonind.-Ztg.* **45**, 157(1921).

MARTIN, L.: *Die gewinnung von schwefel und schwefelsäure aus gips.* Berlin: Verlag Tonind.-Ztg. 12 pp. M1.50. For review see *Tonind.-Ztg.* **45**, 91(1921).

Sulfuric acid. SOUTH METROPOLITAN GAS CO. Brit. 156,328, Oct. 6, 1919. SO_2 is bubbled through nitrous vitriol near the surface, the depth of seal not exceeding 4 inches. A suitable app. is specified.

Controlling chemical processes; sulfuric acid manufacture. L. LOGAN. Brit. 151,328, June 18, 1919. In app. for regulating production, a sample of the initial material is withdrawn and is passed to a testing app. which acts in such a manner that the presence of an undesirable substance in the sample causes a variation in the quantity or character of radiant energy such as light projected through the app., and the variation so produced is utilized to operate means controlling the process of production. The invention is described with reference to the manuf. of H_2SO_4 by the contact method, the control depending on the presence of arsenic in the reduction gases. A full description is given.

Nitric acid. Y. KAWAKITA. U. S. 1,371,789, Mar. 15. A jet of air under pressure is forced into a chamber containing H_2O so as to cause the air to draw a jet of H_2O into the chamber and atomize the H_2O . An elec. current is intermittently passed through the jet of H_2O and elec. sparks are passed between the jet and the body of H_2O within the chamber, rapidly to heat the air to a high temp. and form N oxides. The heat generated by the sparks evaps. atomized H_2O and thus a sudden fall in temp. is produced, which cools the gas produced and assists in the production of HNO_3 .

Nitric acid. BRUNO THOMAS. Can. 210,384, Apr. 12, 1921. HNO_3 is made by absorbing nitrogenous gas in a liquid under pressure and at the same time converting the lower oxides of N into HNO_3 by electrolysis.

Nitric acid. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Brit. 156,800, Jan. 7, 1921. In the prepn. of concd. HNO_3 by the absorption of nitrous gases in strong H_2SO_4 the nitrosulfonic acid produced is decompd. by means of vapors of aq. HNO_3 . The latter, together with a gas, preferably containing O, for instance air, are passed into the bottom of a tower packed with acid-resisting material, down which the nitrosulfonic acid is allowed to flow. Nitrous gases and vapors of HNO_3 are evolved. The latter on condensation form red fuming HNO_3 , while the former are condensed in H_2O and used for decompg. further quantities of nitrosulfonic acid. The N oxides obtained by passing air through the fuming HNO_3 to decolorize it, are similarly employed. The concn. of the denitrated H_2SO_4 is 80%.

Nitrous gases. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Brit. 156-799, Jan. 7, 1921. Dil. nitrous gases of a low degree of oxidation are absorbed by means of H_2SO_4 of 90-91% strength, directly without preliminary oxidation. The resulting nitrosylsulfuric acid can be almost completely denitrated by allowing it to flow down a heated dephlegmation app. The residual H_2SO_4 is sufficiently strong to be used repeatedly for further absorption of nitrous gases. The concd. nitrous gases which are evolved may be converted into 67% HNO_3 by treatment with air and H_2O or may be used for the production of liquid N_2O_4 or other products.

Ammonia. L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 156,135, Dec. 30, 1920. In the manuf. of NH_3 by the hyper-pressure process as set forth in 130,086 (C. A. 14, 104), H is sepd. from coal gas by the use of solvents as set forth in 130,092 (C. A. 14, 104), 130,358 (C. A. 14, 103), and 131,091, methane being obtained at the same time. CO_2 is added to the H if necessary. Cf. 130,365 (C. A. 14, 99). In applying the process to existing coke ovens, to replace in part the gases thus utilized, water gas for calorific purposes therein is prepd. by cooling the incandescent coke by means of steam in a specified app.

Synthetic ammonia. NITROGEN CORPORATION. Brit. 156,698, Jan. 7, 1921. A catalyst for the synthesis of NH_3 consists of an alkali or alk. earth metal cyanogen compd., which has been heated in NH_3 gas. A support for the catalyst, e. g., pumice, may be employed. The starting material may be $Ca_2Fe(CN)_6$, $Ba_2Fe(CN)_6$, $K_4Fe(CN)_6$, $K_3Fe(CN)_6$, or a double cyanide, such as $K_2Cr(CN)_6$, $K_2Cr(CN)_6$, $CoCaFe(CN)_6$, $K_4Mn(CN)_6$, $Ba_2Mn(CN)_6$, $K_4Mn(CN)_6$, $K_4Co(CN)_6$, and $Sr_2Ti(CN)_6$. According to the example, pumice is immersed in a soln. of $Ca_2Fe(CN)_6$, the H_2O evapd. off, and the residue preliminarily heated to about 350° preferably in an atm. of O-free H or N, or in a mixt. of both, or in an atm. of NH_3 . The material is then transferred to the working autoclave and heated to a temp. not above 650° in a current of NH_3 gas, preferably under atm. pressure. The product is capable of synthesizing NH_3 at a temp. of about 400° under a pressure of 100 atm. Cf. 155,592.

Potash. F. JOURDAN and G. A. BLANC. Brit. 156,547, Jan. 5, 1921. Potash is extd. from leucite and leucitic rocks by treatment, at elevated temps. and pressures, with milk of lime, MgO or other strong base. The leucite, isolated from extraneous materials, is finely ground and agitated with a milk formed from the base, preferably

CaO, in an autoclave. The potash is dissolved and a mud results which on heating forms a cement. Potash not extd. by the base is recovered by volatilization during this second heat treatment.

Cyanides; carbon. NITROGEN PRODUCTS CO. Brit. 156,479, Jan. 5, 1921. In the fixation of N as cyanide by means of a mixt. of an alkali or alk. earth compd., C and Fe by the Bucher process, the reaction mixt., preferably in the form of briquets, is heated by a non-nitrogenous gas such as CO or argon, and when it has reached the reaction temp., heated N is admitted. Preferably the heating gas traverses the charge upwardly and the N downwardly. A suitable app. is specified.

Perborates; perphosphates. S. ASCHKENASI. Brit. 156,713, Jan. 7, 1921. Alkali perborates and perphosphates are produced by evapg. under reduced pressure and with moderate heating a mixt. of concd. H_2O_2 and alkali borate or phosphate. The alkali salts mentioned are Na metaborate and disodium phosphate. A Na perborate of higher content of active O may be obtained by evapg. the perborate produced as above described with H_2O_2 under reduced pressure and with moderate heating.

Perborates. S. ASCHKENASI. Brit. 156,714, Jan. 7, 1921. A stable perborate is obtained by one of the known processes so that the active O does not exceed about 23%.

Metallic salts. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,213, Jan. 3, 1921. In the manuf. of metallic salts by treating metals, or their salts of a low stage of oxidation, with acids to give the corresponding salts of a higher stage of oxidation, the reaction is carried out in the presence of O or a gas containing O and an O carrier at suitable temps. and pressures. In examples, Hg sulfate and phosphate are prepd. by treating the metal with the corresponding acid in the presence of a small amt. of fuming HNO_3 and introducing O. $Fe_2(SO_4)_3$ is obtained by introducing NO and O under pressure into the H_2SO_4 soln. of $FeSO_4$. By the above process, the formation of impurities due to the reducing action of the metal is avoided. The production of $CuSO_4$ is referred to.

Lead sulfate. P. A. MACKAY. Brit. 155,945, Oct. 18, 1919. Metallic Pb is treated with oleum at 150° and the reaction is then continued at a lower temp., say about 100° . If the Pb is first coated with a more electronegative metal such as Hg, Cu, or Ag, for instance by treating with Hg or Cu sulfate, or if a compd. of such a metal is added to the reaction mass, the reaction begins at $90-100^\circ$, and continues without external heat. An excess of oleum is preferably used, and the $PbSO_4$ is pptd. by addition of H_2O . If Bi or Ag is present in the Pb the sulfates are obtained in the soln. after the removal of the $PbSO_4$. The excess acid may be recovered.

Thorium salts. H. WADE. Brit. 156,892, Oct. 11, 1919. A salt having the compn. $Th(PO_3)_2SO_4$ is obtained by heating at about 280° a soln. of Th sulfate to which has been added H_3PO_4 . After several hrs. the product seps. as needle-shaped crystals insol. in H_2O or dil. acid. Alternatively Th phosphate may be heated with H_2SO_4 or, for a less pure product, a native Th phosphate such as monazite may be used; the new product seps. out while the rare earths do not. Cf. 112,380 and 117,438.

Recovering potassium salts from tang. ALASKA PRODUCTS CO. Norw. 30,905, July 20, 1920. The tang is finely ground and treated with an acid reagent in amt. just sufficient to ppt. the slimed solids in the form of a coagulated sediment. The sediment is sepd. from the liquid which is evapd. to crystn.

Barium chloride. J. FURUKAWA. Japan 36,496, June 3, 1920. Chlorine gas is passed into aq. BaS (30° Bé) until the soln. becomes acid. It is neutralized with $Ba(OH)_2$ or $BaCO_3$, sepd. from S by filter-press, concd. to 40° Bé. by evapn. and set aside. $BaCl_2$ crystallizes out.

Chromic salts from chrome ore. M. MARUYAMA. Japan 36,484, June 2, 1920. Above 95% Cr is extd. as salts by the following method. A mixt. of 3.75 kg. finely

powdered ore, containing 95% FeCr_2O_4 , and 487.5 g. powdered charcoal is put into an iron tube 5 in. in diam. and 5 ft. long. Dried Cl_2 at the rate of 1 cu. ft. per 5 min. is passed into the tube, heated at 700–750° and rotated intermittently, producing CrCl_3 according to the equation: $\text{FeCr}_2\text{O}_4 + 4\frac{1}{2}\text{Cl}_2 + 4\text{C} = \text{FeCl}_3 + 2\text{CrCl}_3 + 4\text{CO}$. After cooling, the contents are dissolved in H_2O . $\text{Fe}(\text{OH})_3$ and $\text{Cr}(\text{OH})_3$ are pptd. by adding milk of lime, filtered and washed. By passing Cl_2 into the suspension of the hydroxides in H_2O , $\text{Cr}(\text{OH})_3$ is changed to H_2CrO_4 and then filtered. CaCrO_4 is pptd. from the filtrate by adding milk of lime, which is utilized for the prepn. of other Cr salts.

Zinc polysulfide; lithopone. FABRIQUES DE PRODUITS CHIMIQUES DE TRANN ET DE MULHOUSE. Brit. 155,824, Dec. 11, 1920. Zn polysulfide is obtained by pptn. of a Zn salt, such as ZnCl_2 , with an alkali or alk. earth polysulfide, such as a Ba polysulfide, while an excess of the Zn salt is maintained. The ZnCl_2 may be obtained by treating ZnSO_4 with BaCl_2 and the BaSO_4 is reduced to sulfide, dissolved, and converted into any polysulfide by treatment with the requisite quantity of S. Lithopone is obtained by pptg. ZnSO_4 with Ba polysulfide in presence of a sol. Zn salt other than the sulfate. The pptd. Zn polysulfide is completely washed and dried and is heated first at about 300°, until any oxide present is converted into sulfide, the SO_2 being removed, and then to about 700°. The heating is effected in a clay crucible and a current of inert gas such as N may be passed through. The S expelled may be collected and used for making more Ba polysulfide.

Drying salts. SOUTH METROPOLITAN GAS CO. Brit. 156,963, Nov. 14, 1919. App. for drying salts, particularly $(\text{NH}_4)_2\text{SO}_4$, of the kind in which the material falls in a shower down a shaft wherein it is dried by ascending hot gases, comprises cones disposed at different levels in the shaft, baffle-bars, preferably of triangular section between the cones, and means such as baffles for directing the falling material from cone to cone. The salt-receiving surfaces may be subjected to continuous or intermittent concussion or vibration. A suitable app. is specified.

Nitrogen. C. T. THORSELL and H. L. R. LUNDEN. Brit. 155,814, Nov. 16, 1920. N is produced by absorption of O from a mixt. of N and O by means of metals such as Fe, followed by the regeneration of the metal from the oxide produced; the heat generated by the absorption reaction is utilized to provide the heat required for the regeneration process. Since too large an excess of heat is developed by the use of atm. air in the absorption reaction, gases containing only about 10% of O are employed, e. g., flue gases from industrial plants, or mixts. of these gases with atm. air. A suitable construction is specified.

Nitrogen. C. T. THORSELL and H. L. R. LUNDEN. Brit. 155,815, Nov. 16, 1920. N is produced by absorption of the O from air by passage over a metal such as Fe, followed by regeneration of the metal by means of water gas. In the regeneration process the danger arising from the formation of soot is avoided by introducing CO_2 into the water gas before it enters the regeneration app. The CO_2 may be that contained in water gas which has already been through the app.

Nitrogen oxides. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Brit. 156,797, Jan. 7, 1921. Solid N oxides produced by the refrigeration of nitrous gases of low concn. are removed from the refrigerating device by mixt. with a quantity of a N oxide. In one form of the process a quantity of N_2O_4 is mixed with the dil. nitrous gas before refrigeration, which then gives a liquid product. In another form one of the refrigerating chambers is cut out of the circuit when a quantity of solid oxide has accumulated in it, and NO is added to liquefy the solid oxide.

Production of nitrogen oxide in internal-combustion engines. F. GERHARDT. Ger. 321,981, Dec. 9, 1915. Addition to 303,255. According to the principal patent a rapid and complete combustion is effected by means of a vigorous whirling of gas and

air effected with the aid of a strong current of gas or air. The modification of the present patent consists in heating the current of gas or air, before introduction, by means of the heat of the exhaust gases.

Emulsions. L. STEIN. Brit. 156,546, Jan. 5, 1921. Oils, resin, and other substances insol. in H_2O are emulsified by mixing their solns. in inert org. liquids (benzene, benzene, CCl_4 , etc.) with excess of concd. waste sulfite cellulose liquor. The products can be used for tanning, for dressing cloth, or as agglutinants.

Treating albumin. E. BRAUCHLI. Brit. 156,796, Jan. 7, 1921. Albumin is dissolved in glycerol and the soln. is heated on a waterbath to coagulate the albumin. A homogeneous paste results which is either white or opalescent according to the strength of the soln. Fillers and coloring agents may, if sol., be dissolved in the glycerol, or they may be incorporated with the mass after coagulation.

Precipitating rare earth metal compounds. O. DIETRICH. U. S. 1,371,741, Mar. 15. Fluorspar is used to ppt. rare earth compds. from boiling solns. in the form of coarse-grained easily washed ppts., which can be calcined without sintering. $NaCl$ may be used to facilitate the pptn. Insol. phosphates, tungstates or other insol. or but slightly sol. compds. of Ca, Ba, Sr or Al also may be used as precipitants.

Dispersoids. H. PLAUSON and J. A. VIELLE. Brit. 155,836, Dec. 24, 1920. Dispersoids or colloidal suspensions of ores, dyes, paints, graphite, S, cellulose, or other materials are obtained by pounding or rubbing the ground substance in a dispersion medium which is a non-conductor or a poor conductor of electricity, the moving surfaces having a velocity of not less than 2000 m. per min., and preferably of 1000 m. per second. Dispersion may be assisted by adding solvent chemical agents, or those which form labile compds. with the dispersion medium.

Dispersoids; colloid powders, etc. H. PLAUSON and J. A. VIELLE. Brit. 156,142, Dec. 31, 1920. Colloid materials are disintegrated between surfaces having very rapid movement, for instance by means of the app. described in 155,836 (preceding pat.) in the presence of a large quantity of a non-solvent which acts as a dispersion medium. The presence of a small quantity of soap, or of a substance in which the colloid dissolves or swells, is desirable in some cases. The products are in sol. form or closely resemble it, and may be obtained finally as powder or paste or mixed with fillers and pressed into any shape required. According to examples, gelatin is dispersed in alc., soap being added, and the alc. finally evapd. off from the disperse gelatin. Benzene, benzene, petroleum, chlorinated hydrocarbons, ketones, or oils may be used in place of alc. The gelatin may be rendered insol. in H_2O by action of tannin, $HCHO$, chromates, salts of Al, etc., at any suitable stage. Other colloids such as glue, agar agar, tragacanth, gum, starch, dextrin, carrageen moss, yeast, casein, albumin, phenol-condensation products, rubber, may be similarly treated. Anhydrous protein may be dispersed in benzene. $HCHO$, tannin, or other coagulating agent may be added or coagulation obtained by heat. Alcs., ketones, benzene, xylene, chlorinated hydrocarbons, etc., may be used in place of protein. Acetylcellulose or nitrocellulose may be dispersed in xylene and acetone or dichlorohydrin or tetrachloroethane. Resins, asphalts, water-insol. caseins, starch, albumin, yeast, etc., can be added to the product. Xylene may be replaced by benzene, benzene, petroleum, turpentine, and chlorinated hydrocarbons, ketones, glycols, alcohols, esters, etc., can be used as accelerators. H_2O can be used as dispersion medium for insol. colloids.

Waterproofing compositions. C. CLAESSEN. Brit. 155,778, Dec. 22, 1920. Nitrocellulose is mixed with a non-volatile liquid gelatinizing agent, which is not readily inflammable, such as substituted urea or its thio or halogen derivs. The resulting plastic mass may be applied by means of hot rolls to a fabric to form floor-cloth, waterproof fabrics, or the like. Typical compus. contain 25-50 parts of nitrocellulose and 20-40 parts of gelatinizing substance, in addition to the usual filling and coloring agents.

Plastic compositions. H. PLAUSON and J. A. VIELLE. Brit. 156,137, Dec. 31, 1920. A resinous substance prepd. by condensing a ketone and an aldehyde or polymer thereof by treatment with an alkali, is produced in presence of a pulverulent substance such as ground wood, peat, straw, paper or metal. After removal of excess alkali and moisture, the powder is pressed or stamped into any desired form at pressures of 150–500 atm. and temps. of 120–200°. Fillers such as cement, graphite, talc, kaolin, heavy spar, lithopone, glass powder, etc., may be mixed with the materials before condensation, or elastic and insulating properties may be obtained by the addition of rubber resin or other resins, shellac, cellulose esters, ebonite etc., either before or after the condensation.

Phenol-aldehyde condensation products. LORIVAL MANUFACTURING CO. Brit. 156,675, Jan. 6, 1921. An initial liquid phenol-HCHO condensation product is prepd. by the reaction of phenols (phenol, cresols, naphthols) with anhydrous polymers of HCHO (paraformaldehyde, trioxymethylene) in the presence or absence of alk. catalysts; this liquid product is converted into the final insol. infusible product by addition of liquid organic acids (lactic, acetic, formic, ricinoleic, etc.) or solid org. acids such as oxalic, tartaric, citric, gallic, or tannic acid, dissolved in a liquid organic acid together with small amts. of a mineral acid (HCl, oxyacids of S or P, boric, etc.); the conversion takes place in the cold, or more rapidly on heating. The initial liquid product with the acids added can be used as a varnish, or for glueing together laminae of wood, wood and fabrics etc. Fillers, such as pumice, sand, glass, emery, asbestos, insol. minerals, paper pulp, sawdust, cotton, etc., may be incorporated in the mass, or its properties varied by addition of gelatin, glue, naphthalene, rubber, etc. Vessels resisting chemical reagents can be made from the final product, or laminae or plates thereof can be glued on surfaces by means of the initial product varnish.

Solutions of phenol-aldehyde condensation products. G. H. HOWSE. Brit. 156,896, Oct. 13, 1919. Solns. of resinous phenol-aldehyde condensation products, suitable for use in making varnishes, lacquers, paints, cements, insulating materials, etc., are prepd. by dissolving the resins in benzyl alc. with or without the addition of nitrobenzene. Any one or more of the following materials may be added to the solns.: aliphatic O compds. (such as ketones or methylated spirit), aliphatic hydrocarbons or their halogen compds., benzene, xylene, nitronaphthalenes, aromatic acids or their salts or esters, *e. g.*, benzenesulfonic acid, naphthalenesulfonic acids, or naphthionic acid, pitches, bitumen, nitrated or sulfonated fatty acids, drying oils, linseed, tung fish, lumbang, or perilla oils, resins, *e. g.*, shellac, gums, rubber, waxes, cellulose, nitrocellulose, casein, dyes, pigments, or fillers.

Extruded phenolic condensation products. H. C. EGERTON. U. S. 1,370,800, Mar. 8. Articles such as tubes, rods or sheets are formed from a mixt. of partially cured phenolic condensation product and fibrous material, by heating and extruding the mixt. under pressure through a die and cooling the product before the pressure is released from it.

Feeding device for sulfur-burners. F. B. CHAPPELL. U. S. 1,370,627, Mar. 8.

Talking-machine record. E. A. WIDMANN. U. S. 1,370,719, Mar. 8. Molded sound-records are formed with a surface portion of shellac-like material welded or coalesced with a backing of material of higher m. p. such as hard varnish gums or resins, *e. g.*, "Congo sorts," kauri, dammar or red gum.

Shoe-dressing. B. P. JOHNSON. U. S. 1,370,819, Mar. 8. A shoe-dressing adapted for use on white shoes is formed of ZnO 16 oz., glue 3 oz., gypsum 6 oz., NH₃ soln. 1 oz. and H₂O 1 gal. with a small amt. of blue coloring matter.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Some common defects occurring in glass. J. B. KRAK. *Glass Ind.* 2, 1-3 (1921).—*Causes and prevention or elimination of seeds and stones.*—Seed may be caused by too much CO₂ or CO in the flame above the glass, and also by too high a temp. or too much alkali; it may be avoided by regulation of the stack draft, by temp. control and by proper compounding of the batch. Sometimes the evolution of gas from an onion or potato is effective, or As may be used. Batch stones, pot stones and cap stones are briefly discussed. J. B. PATCH

Progress made in plate-glass manufacture. J. W. CRUIKSHANK. *Glass Ind.* 2, 3-6 (1921).—The method of *teeming plate glass* 30 years ago is described and compared with the present-day mechanical method, in which machines have largely taken the place of men. While there have been no fundamental changes of process, great progress has been made toward perfecting the art. J. B. PATCH

Manufacture of mother-of-pearl glass. O. SCHWARZBACH. *Glass Ind.* 2, 7-8 (1921).—See C. A. 14, 3512. J. B. PATCH

Glass industry in England and the United States. W. E. S. TURNER. *Glass Ind.* 2, 10-11 (1921); *Pottery and Glass Record*, Dec. 15, 1920. J. B. PATCH

Cutting bottle molds automatically. ANON. *Glass Ind.* 2, 23 (1921).—Description with illustrations of machine developed by the Keller Mechanical Engraving Co. for cutting 2 duplicates of any bottle mold half simultaneously. J. B. PATCH

Recent simplex leer installation. ANON. *Glass Ind.* 2, 24 (1921).—Description of installation at the plant of the Federal Glass Co., Columbus, Ohio. J. B. PATCH

Devitrification and revitrification of glass. J. B. KRAK. *Glass Ind.* 2, 29-31 (1921).—A brief discussion of the nature of these changes and the circumstances under which they occur. J. B. PATCH

Evolution of the mold industry. GEORGE B. ARDUSER. *Glass Ind.* 2, 35-6 (1921).—A brief statement chiefly relating to present practice. J. B. PATCH

Saving fuel by controlling chimney losses. F. F. UEHILING. *Glass Ind.* 2, 37-9 (1921).—*In the av. boiler plant*, 35% of the heat generated is lost in gases going up the stack, while only 4% is lost by radiation and only 4% is lost in unburned coal. The excessive loss up the stack is usually due to lack of instruments for detg. whether the proper amt. of air is being supplied. The percentage of CO₂ is the most important index. CO₂ recorders should be in every plant, and firemen should be instructed to keep the CO₂ content close to the max. safe percentage. J. B. PATCH

Automatic bottle manufacture. GEORGE E. HOWARD. *Glass Ind.* 2, 55-9 (1921).—A discussion and comparison of the Owens process and the more recent feeder processes of bottle manuf., by the inventor of the Howard feeder. J. B. PATCH

Bloomery furnaces and other turned pieces made on a potter's wheel. A. H. WESSLEY. *Sprechsaal* 54, 1-2 (1921).—A brief description of an old art. R. J. M.

Fuel and heat used in glass works. H. MAURACH. *Sprechsaal* 54, 36-8 (1921).—Coal consumption statistics are given. The importance of conserving fuel is emphasized and in that connection data are given as to the *thermal efficiency of typical glass furnaces*. Of the heat obtained from the coal, 15% is lost in the producer, 19% goes up the stack, 43% is lost by radiation and conduction from the furnace itself and 10% from the conduit pipes and regenerators and only 12.5% goes into the glass. It is stated that in practice from 1 to 1.3 lbs. of coal are required to produce 1 lb. of glass.

Composition of glass for pressed tumblers. *Schnurpfel's Rev. for Glass Works* 4, 797 (1921).—Sand 100 lb., soda ash 34 lb., lime 12, barytes 10, saltpetre 1 lb., arsenic ¼ lb., manganese 5 oz. R. J. MONTGOMERY

Composition of glass for electric lamp bulbs. *Schnurpfell's Rev. for Glass Works* 4, 797 (1921).—Sand 100, soda ash 80, red lead 35, lime 5, saltpeter 4, borax 2, manganese $\frac{1}{4}$, arsenic $\frac{1}{4}$.

R. J. MONTGOMERY

The silicate chemist in industry. C. LOESER. *Chem. Ztg.* 44, 955-6 (1920).—The silicate chemist has to develop a field between those of the pure chemist and the mechanical engineer. His technical training should be designed to give a thorough knowledge of the fundamentals of chemistry with particular emphasis on inorg. chemistry. In addition he requires instruction in structural and mechanical engineering.

J. S. LAIRD

Shrinkage on drying kaolins and clays. A. BIGOT. *Compt. rend.* 172, 755-8 (1921).—Small test specimens were made from a number of kaolins and clays of French origin, usually molded by hand in plaster molds from a soft paste; a few specimens were formed in steel molds under pressure. The specimens were dried in air and finally at 110°, detn. of length and wt. being made at intervals. The water given off while the specimen was shrinking was called colloidal water, that given off after shrinkage had ceased interposed (pore) water. A number to express the plasticity of the clay was obtained by dividing the wt. of colloidal water by the wt. of total water and multiplying by the shrinkage. The chemical analyses, colloidal water, total water, contraction, and plasticity numbers of the clays examd. are given in a table.

J. S. LAIRD

Georgia (kaolin) clays and their development. T. P. MAYNARD. *Manufacturers' Rec.* 78, No. 10, 135-9 (1920).—The white clay deposits of Georgia are very extensive, occurring largely in the coastal plain. The kaolin mined has been used largely in the manuf. of paper, but also in rubber goods, paints, pottery. The clays are sedimentary and plastic, but vary widely in their properties and in compn. from typical kaolin to bauxite.

J. S. LAIRD

Can Swedish quartz be replaced by German sandstone. P. BARTEL. *Keram. Rundschau* 28, 449-450, 459-460 (1920).—Reike and Endell (*Silikat-Z.* 1913, 48) found that bodies containing sand were grayer than those containing quartz even when the sand was purer than the quartz. This is attributed to a difference in structure. The sand grains do not become cracked or shattered, when calcined, as the quartz grains do and hence sand grains do not reflect the light from as many surfaces.

H. G. SCHURECHT

Porcelain enameling furnaces. C. G. ARMSTRONG. *Chem. Met. Eng.* 24, 486-8 (1920).—SiC refractories are stronger than fireclay and require walls only one-half to one-fourth as thick. This together with the high thermal cond. permits a lower temp. difference between flues and muffle, more uniform temp. distribution, a more rapid heating rate, and fuel saving of 30%.

DONALD E. SHARP

A comparison of monochromatic screens for optical pyrometry (FORSYTHE) 2.

Taschenbuch für keramiker 1921. Berlin: Verlag Keramische Rundschau G. m. b. H. M8. For review see *Tonind.-Ztg.* 45, 37 (1921).

Glass-making. A. FERGUSON. U. S. 1,371,084, Mar. 8. Particles of glass-making materials are subjected to a vortical whirl with gas at smelting heat and the viscous material thus formed is led downward into a bath of molten glass.

Removing striae from molten glass. S. R. SCHOLES, L. W. NICHOLS and W. F. KAUFMAN. U. S. 1,370,673, Mar. 8. The pot holding molten glass is moved with its contents around an axis inclined to the horizontal until a complete mixing of the constituents of the glass batch is effected.

Mirrors. J. RHEINBERG. Brit. 156,472, Sept. 16, 1920. Homogeneous structureless mirror surfaces are produced by coating glass with a film of collodion containing a salt of Pt or of a metal of the Pt group, and subsequently heating the glass in a furnace.

The collodion coating mixt. is prepd. by dissolving a sol. gumcotton such as celloidin or pyroxyline in MeOH and adding to it a soln., preferably in ethyl alc., of the metal salt. Examples of suitable metallic salts are Pt chloride, chloroplatinic acid, Pd chloride, Ir chloride, and chloroiridic acid. According to the temp. to which the glass is raised, the mirror surface is either a loose deposit, an adherent deposit, or completely incorporated in the surface layer of the glass. A small proportion of a lead salt or of a bismuth salt may be added to the mixt. to reduce the temp. to which it is necessary to raise the glass.

Apparatus for forming hollow glass articles. A. FERGUSON. U. S. 1,371,085, Mar. 8.

Refractory substances. A. ROLLASON. Brit. 156,447, April 21, 1920. A refractory material for lining furnaces is made by roasting at about 1800° magnesite or dolomite in granular form with 5-10% of basic slag in an internally fired rotary kiln having a basic lining. From the kiln the material passes into an annealing chamber, where it is allowed to cool slowly.

Furnaces or ovens adapted for baking enameled metal articles. H. B. CANNON. U. S. 1,371,773-4, Mar. 15. The combustion chamber of the furnace is mainly formed of SiC and is arranged to heat articles in an adjacent chamber by radiation.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

A new type of automatic cement tester. T. Y. OLSEN. *Proc. Am. Soc. for Testing Materials* 20, II, 408-10(1920).—The app. is similar in a no. of respects to the ordinary shot machine. The load is applied by a lever carrying a heavy weight. When not in use, this lever is supported at one end by a column of liquid confined in a vertical cylinder. When a briquet is in position, the lever is set in motion by turning a thumb screw, which allows the oil to float from the cylinder, and the load is applied at the rate of 600 pounds per min.

J. C. WIRT

Report of Sub-Committee VI on weight, voids, density, specific gravity and consistency. CLOYD M. CHAPMAN, *et al.* *Proc. Am. Soc. for Testing Materials* 20, I, 341-79 (1920).—The object of the investigation was to det. the method and app. by which the most satisfactory results may be obtained in the detn. of the unit wts. of aggregates, by different operators, under different conditions. The variables considered were: (1) size and shape of the measure; (2) method of filling the measure; (3) the amt. of moisture in aggregate. The sub-committee selected 9 methods and drew up a complete description of the app. and methods to be used in making the detns. of unit wt. and computed and tabulated all results reported. Seven laboratories coöperated in the investigation. A careful investigation of the data obtained leads to the conclusion that the "rod method" is the most useful and satisfactory. This is as follows: Make the measure one-third full, level off the top surface with the fingers, tamp with pointed rod 25 times. Make the measure two-thirds full and tamp 25 times. Fill measure to overflowing, tamp 25 times. Strike off surplus aggregate, using rod as straight edge and weigh.

J. C. WIRT

Lime-mortars: Solution and conversion of solid substances into colloids. V. KOHLSCHÜTTER and G. WALTHER. *Z. Elektrochem.* 25, 159-83(1919).—The rate at which CaO, prepd. from CaCO₃, Ca(OH)₂, and Ca oxalate, resp., combines with water vapor at the ordinary temp. has been detd. The vol. changes and the amt. of water taken up have also been detd. The rate of absorption is shown to differ with the various samples of CaO. Further, the rate of sedimentation of Ca(OH)₂ has been measured for Ca(OH)₂ prepd. by slaking lime in water or solns. of CaCl₂, Ca(NO₃)₂, NaCl, KCl, KNO₃, NaOH, AcONa, KCNS, NH₃, NH₄ oxalate, and Na carbonate of various concns.

The rate at which sedimentation occurs varies with the different electrolytes; some when in small concns. increase the sedimentation velocity, and in large concns. decrease it, while in other cases the reverse is the case. The velocity of sedimentation is greater when water is added to quicklime than when lime is added to water. Further, a difference is observed in the rate of sedimentation of $\text{Ca}(\text{OH})_2$ produced by slaking lime in lime-water. The sedimented product of a suspension of $\text{Ca}(\text{OH})_2$ in water is not the same as the product obtained by slaking lime in water and allowing it to settle. The results obtained indicate that in the production of a true soln. of $\text{Ca}(\text{OH})_2$ in water from lime, an intermediate colloidal state is first formed.

J. C. S.

Report of Committee C-11 on gypsum. WARREN E. EMBLEY, *et al.* *Proc. Am. Soc. for Testing Materials* 20, 1, 380-6(1920).—The report includes recommendations of the committee on revisions of specifications as follows: Tentative specifications for gypsum, tentative specifications for calcined gypsum, tentative methods for tests of gypsum and gypsum products, and specifications for gypsum plasters. In the tentative methods for tests of gypsum and gypsum products are considered the temp. of drying, the size of screen used for fineness detn., the chem. detn. of SiO_2 and MgO , the method of calcg. results, the detn. of normal consistency by means of the Southard viscosimeter, water-carrying capacity, dry bulk, wet bulk, time of setting, tensile strength and compressive strength.

J. C. WIRT

Tentative methods for tests of gypsum and gypsum products. ANON. *Proc. Am. Soc. for Testing Materials* 20, 1, 634-46(1920).—The tests considered are free H_2O in gypsum, fineness, chem. analysis of gypsum and calcined gypsum, microscopic examn. of gypsum and calcined gypsum, precaution for physical tests, normal consistency of calcined gypsum, water-carrying capacity, detn. of dry bulk, detn. of wet bulk, time of setting, tensile strength, compressive strength, and sand-carrying capacity of calcined gypsum. The methods for chem. analysis include prepn. of sample, detn. of combined H_2O , CO_2 , SiO_2 , Fe_2O_3 , Al_2O_3 , CaO , MgO , SO_3 and Cl and directions for calcg. results.

J. C. WIRT

Plastic gypsum plaster. WARREN E. EMBLEY. *Chem. Met. Eng.* 24, 740-1(1921).—Advance description of a method of prepg. gypsum plaster to obviate the necessity of adding lime to increase its plasticity; the patent when issued is to be for free public use in the U. S. A. The method consists in fine grinding the calcined gypsum in a ball or tube mill at the same time preventing the escape of water, so that the product leaving the mill contains 9 parts by wt. H_2O to 136 parts CaSO_4 , or about 6.2% H_2O . "If the grinding is sufficient to liberate all of the water [i. e., with air passing through the mill] the resultant product is sol. anhydrite. This is a peculiar form of anhydrous CaSO_4 and differs from the mineral anhydrite in its great affinity for water—a very short exposure to moist air is sufficient to change it back to the hemi-hydrate. When calcined gypsum is subjected to grinding under such circumstances that water is not permitted to escape from the system, an entirely new product results. No satisfactory explanation has yet been evolved but the fact remains that the product is plastic. Up to a certain limit, the degree of plasticity seems to depend upon the duration and speed of grinding.

JEROME ALEXANDER

RIEPPERT: Zement-Kalender 1921. Charlottenburg: Zementverlag. 382 pp. M10.50. For review see *Tonind-Ztg.* 45, 104(1921).

Keene's cement. W. HOSKINS. U. S. 1,370,968, Mar. 8. Keene's cement stock is produced by passing finely subdivided gypsum continuously through a rotary internally fired kiln and adding $\text{Ca}(\text{OH})_2$ in sufficient amt. to neutralize all acidity.

Cements. H. D. BAYLOR. Brit. 155,431, Nov. 8, 1919. Cement is rendered slow-setting, plastic, and waterproof by adding CaO and sufficient water to hydrate

the aluminates and the CaO formed by the decompn. of the aluminates, and also the lime added, and incorporating an unsaponifiable, oily or waxy material during the hydration, and grinding the mixt. During the reaction, the mixt. is mechanically agitated. In an example, with 1620 lb. of cement are ground 200 lb. of quick-lime. Sufficient H_2O is added to hydrate the added lime and to decompose and hydrate the aluminates in the cement. At the same time 30 lb. of "slops," the residue of petroleum distn. or similar material, are added, and the mixt. is stirred until a dry mass results. This is ground. Cf. 158,390.

Concrete. K. WINKLER. Brit. 156,621, Jan. 6, 1921. A waterproofing compn. to be added in the proportion of about 1 kg. to 12 kg. of the gaging H_2O for mortar, cement, concrete, etc. is made by mixing about 3 parts 10° Bé. K_2SiO_3 soln. with $2\frac{1}{2}$ parts freshly made $CaCl_2$ soln. of $7-10^\circ$ Bé., and mixing the colloid thus produced with 8-15 % of its wt. of dust-fine pure $CaCO_3$, and $\frac{1}{8}\%$ fat or oil emulsified with $\frac{1}{16}\%$ KOH soln. Carbide mud may be used for $CaCO_3$; chalk is unsuitable. The properties of the mortar, etc., may be varied by altering the proportions of the constituents of the waterproofing compn. Thus, quick setting is obtained by increasing the proportion of $CaCl_2$, rapid hardening and water-tightness by increasing the KOH. The proportion of fat, or oil, and $CaCO_3$ must never be increased. To prevent efflorescence, decompn., cracking, etc., when the original proportions are departed from, an addition of a small % of one or more of the following may also be made, *vis.* sugar, K dichromate, chromate, ferrocyanide, chloride, or chlorate, bauxite or MnO_2 . KCl and $KClO_3$ are not suitable as additions when there is an excess of K_2SiO_3 .

Reinforced concrete. E. MAIER. Brit. 153,551, Jan. 5, 1921. Reinforced concrete building elements are hardened by treatment with steam under pressure. As an example, a reinforced block is subjected three days after molding to steam at a pressure of 9 atm. for 9 hr., and is then ready for use.

Composition for treating concrete surfaces. A. R. GREEN and H. L. ROSCOE. U. S. 1,371,555, Mar. 15. A compn. for improving old concrete surfaces is formed of $Al_2(SO_4)_3$ 16 oz., H_2SO_4 1 oz. and H_2O 111 oz.

Aging calcined gypsum. H. E. BROOKBY. U. S. 1,370,581, Mar. 8. A small amt. of a H_2O -sol. deliquescent substance such as $CaCl_2$ and $MgCl_2$ is incorporated with unset commercial plaster of Paris in order to produce artificial aging.

Mortar. F. HARTNER. U. S. 1,371,762, Mar. 15. Anhydrite is mixed with an alk. substance such as lime or cement in order to form a mortar suitable for building purposes. Dead-burned lime may be used.

Paving composition. M. B. KENDRICK. U. S. 1,371,032 Mar. 8. A paving material adapted for use with asphalt and cement is formed of sand 90% and NaCl 10%.

Paving material. G. A. HENDERSON. U. S. 1,370,815, Mar. 8. Relatively large pieces of stone free from dust are coated with bitumen, mixed with mineral particles coated with bitumen of a different consistency, and mixed with sufficient bitumen-coated dust to fill the voids and produce a compact paving material.

Fire-proof mortar paint. T. MIZUSHIMA. Japan 36,506, June 3, 1920. Effloresced feldspar (100 parts) is mixed with 200 parts white clay and 50 parts 10% H_2SO_4 , and then mixed with 50 parts shell ash after 24 hrs.

Roofing composition. B. W. and D. O'CONNEL. U. S. 1,370,990, Mar. 8. A compn. for covering roofs, floors or walls is formed of coal ashes 4 and asphalt 1 part together with a small proportion of oil.

Bituminous roofing or flooring composition. R. G. ERWIN. U. S. 1,370,637, Mar. 8. Mineral dust all finer than 200 mesh and 60% of which is smaller than 0.02 mm. is colloiddally suspended in preheated bituminous material together with NaCl, Na_2SO_4 , and pulverized S and the mixt. is heated under suction and mixed with comminuted vegetable material such as rags or wood particles or pulp in pieces of various sizes.

Terrazzo flooring. G. N. JEFFSON. U. S. 1,371,683, Mar. 15. Irregularly shaped chips are formed of wear-resisting granules of antislipping material such as $\text{cryst. Al}_2\text{O}_3$ united by vitrified ceramic material or other tough bonding material, and these chips are set in a cementitious matrix to form a flooring.

Safety-treads. G. N. JEFFSON. U. S. 1,371,684, Mar. 15. The pat. relates to a method of aggregating the ingredients of a product as described in the preceding pat.

Coloring wood. F. E. WILLIAMS. Brit. 153,619, June 12, 1919. For changing its natural color, wood is treated in a bath with a boiling soln. of CuSO_4 and FeSO_4 in substantially equal proportions, which causes a chem. reaction in the pigmentary cells, or albumin, and fiber or grain of the wood itself. A soln. specified is: 1 lb. of FeSO_4 to 10 gals. of H_2O and 1 lb. of CuSO_4 to 40 gals. of H_2O mixed together. Elm treated with this soln. is colored a neutral gray. A suitable construction is specified.

21—FUELS, GAS, TAR AND COKE

A. C. FIEDLNER

Coal, its substitutes and its alternatives. ANDÉ WITZ. *Rev. gén. sci.* 31, 70-9 (1920).—A discussion of the coal situation and the available sources of supply of both cheap and of superior grades in France. Reference is made in particular to the need for more initiative in utilizing substitutes and the cheaper grades, such as lignite, thereby becoming as independent as possible of foreign imports.

C. C. DAVIS

Analysis and examination of various special fuels of French origin. LÉO VIGNON. *Bull. soc. chim.* 29, 110-6 (1921).—Twelve mineral fuels from various places in France were examd. and data obtained showing (1) the alk. or acid reaction of the distillate, (2) the action of boiling 10% KOH soln., (3) H_2O , ash, non-volatile and volatile matter, fixed C, N, and S contents. The distillates were analyzed exhaustively, and all were found to contain a high % of H_2S . The fuels were classed between wood and coal. Also in *J. usines à gaz.* 45, 137-39.

C. C. DAVIS

Air-dried condition and hygroscopicity of fossil coals in relation to the numerical value of their calorific power. R. KEMPF. *Mitt. k. Materialprüfungsamt* 37, 178-227 (1920).—Hysteresis phenomena interfere to a large degree in the attainment of equil. between fossil fuels and a moist atm. If fossil coals are exposed to an atm. half satd. with water vapor until const. in wt., they will take up varying wts. of water according to whether they have been exposed previously to a moist or to a dry atm. This result is attributed to the colloidal nature of the coals. Results of analysis and calorific value should not, therefore, be referred to air-dried coal of unknown moisture content, but to material of known moisture content.

J. C. S. I.

Coal economy. C. MARSCHEIDER. *Chem. Ztg.* 44, 908-9 (1920).—This treats of steam losses and of the economy possible by providing steam conduits with suitable check valves. That recommended is the new Borsig Ideal valve. A graph shows the relation between pressure loss and steam velocity with and without a Borsig Ideal valve. With the ordinary type of check valve, the loss in pressure is 0.95 kg. per sq. cm. for a velocity of 80 m. per sec., whereas with Borsig valve the pressure loss is only 0.08 kg. per sq. cm. for the same velocity. Diagrams and drawings are shown of the new Borsig Ideal valve and of the ordinary type.

C. C. DAVIS

Modern state of heat economy. MAREGRAF. *Feuerungstechnik* 9, 37-41 (1920).—A discussion of various methods of effecting fuel economy made necessary by the late war.

H. C. PARISH

Liquid fuel. A. BERGER. *Rev. gén. sci.* 31, 79-86 (1920).—Liquid fuels have been little used in France owing to their cost. This is a survey of (1) the principal sources.

the production and the kinds of fuels extd. throughout the world, (2) the methods of burning fuel oils and (3) the recognized advantages and economy in its increased use as a source of power.

C. C. DAVIS

Metallurgical use of pulverized fuel. C. F. HERINGTON. *Iron Age* 107, 965-9 (1921).—If furnaces are so designed as to utilize pulverized coal to the best advantage and the fuel is economically conveyed, fed and regulated at the point of consumption, leaving no residue of fine particles of dust on the work, and if the smoke and ash are properly carried away, pulverized coal meets with all of the reasonable requirements and in addition gives a better and a softer heat than any other fuel at present in use. The economy of this fuel over fuel oil is established. Pulverized coal systems have been installed to replace fuel oil where a saving of 60% in cost of fuel per heating operation has been shown. Since powdered coal affords an opportunity to obtain the best combination of air and fuel, it has invariably given increased production as compared with that obtained from the fuel supplanted. About 2000 furnaces using this fuel for metallurgical operations are in existence. The amt. of oxide formed on the steel is decreased and the coal ash does not interfere. Welds made with this fuel are stronger than those made with fuel oil and natural gas.

H. C. PARISH

Industrial application of powdered fuel. JAS. P. SHAGDEN. *Iron Age* 107, 839-42 (1921); cf. C. A. 14, 1028, 3306.—S. discusses the theory of transfer of heat energy and the temp. cycles involved, the design of combustion chambers, and briefly enumerates the processes peculiarly suited to powdered fuel. He advises against too great optimism in setting up the process without a careful study of conditions involved.

J. L. WILEY

Firing with low-grade fuels. E. HAACK. *Brenneri-Ztg.* 36, 8429-30, 8435-6 (1919).—Chimney stacks have usually been erected to deal with high-grade fuels, and do not give sufficient draft where lower qualities are to be burned, although they suffice for the removal of the products of combustion where forced draft is employed. In new construction it is advisable to build chimneys capable of dealing with low-grade fuel. The air supply to the fuel may be assisted by jets of steam or air, the former being simpler. For inducing draft by steam, however, 5-6% of the steam generated by high-grade fuel is consumed as against 1-1.5% for compressed air.

J. S. C. I.

How best to convert a furnace to lignite firing. O. BINDER AND R. SCHARF. *Chem. Ztg.* 45, 237-9 (1921).—By installing some approved type of step-grates. J. L. WILEY

Studies on the calculation of calorific power from the constitution of compounds. F. ORTO H. BINDER. *Chem. Ztg.* 45, 141 (1921).—The Dulong formula for calcg. the calorific power of fuels from the ultimate analysis is based on the false premises that the elements have the same calorific power in compds. as in the free state, and that O is combined with H. The O may be combined with either H or C and the calorific power depends upon what part of the O is combined with each. B. calcs. the calorific power of 2 coals with detd. calorific power of (a) 7931 and (b) 7518 Cal./kg. by the formulas: (1) $8000 C + 29000(H - (O/8)) + 2900 S - 600 W$ and (2) $8000[C - (3/8)O] + 29000 H + 2900 S - 600 W$ in which C = %, C W = % water, etc. He obtains by (1) (a) 7707 and (b) 7665, by (2) (a) 7765 and (b) 7721. The fair agreement of the calcd. values with the detd. values is due to the low percentage of O, 9.09 in (a) and 7.84 in (b). The case of cellulose, 44.43% C, 6.17% H and 49.40% O, corresponding to the formula $C_6H_{10}O_4$, is quite different. The value calcd. by (1) is 3591 and by (2) 4532. The detd. value is 4189. The constitutional formula of cellulose as far as now known shows one O and one C with an unsatd. valence each, which is confirmed by the calcn. of the calorific power. In the calcn., 32 parts O in combining to CO_2 gives 96960 heat units; 1 atom O gives 48480 and 1 valency 24240. 16 parts O combining to form water gives 68920 and 1 valency gives 34460 heat units. Of the 10 O valencies, 3 are combined with H, 6 with C and 1 is free. Six C gives $6 \times 96960 = 581760$ heat units;

10 H gives $10 \times 34460 = 344600$; total 926360 heat units. From this must be taken $3 \times 34460 = 103380$ and $6 \times 24240 = 145440$, total 248820 heat units. This gives a calorific power of $677540 + 162 = 4182$ against the detd. value of 4189. If 7 O valences are assumed to be combined with C the calcd. value is 4033 heat units. It appears that the unsatd. valences are more important in the calcn. than the satd. J. J. MORGAN

Determination of the carbon dioxide in coal. F. S. SINNATT AND W. HARRISON. *Chem. News* 122, 110-13(1921).—In a paper read before the Lancashire and Cheshire Coal Research Assoc., S. and H. review the literature in connection with the estn. of CO_2 in carbonates and describe their app. (C. A. 7, 2367). The sample of coal is pulverized to pass through a $\frac{1}{16}$ mesh sieve, and from 0.5 to 5 g. are put into the decompn. flask, and covered with about twice its vol. (5 to 15 cc.) of distd. water. It is then gently heated, the contents being open to the air, until the water begins to boil and then kept simmering for about 20 minutes. This expels the occluded gases in the coal. Then the carbonates are decomposed with HCl (5%) or H_3PO_4 (sirupy dild. 4 times). After about 10 min. the contents of the decompn. flask are gently heated, the temp. being maintained at about 50° for $\frac{1}{2}$ hr.; then the liquid is raised to the b. p. and held there for 10 minutes. From the beginning of the decompn., a const. current of air is passed through the train of app., sweeping the CO_2 into a collecting flask where it is detd. by means of standard $\text{Ba}(\text{OH})_2$ soln., according to Pettenhofer. The results are practically identical with either HCl or H_3PO_4 . J. L. WILEY

Instrument determines carbon dioxide and detects carbon monoxide. ANON. *Elec. Rev.* (Chicago) 78, 634-6(1921).—A discussion of combustion and the efficiency from analyses. Curves show the relation of flue-gas heat loss to the % CO_2 , and the relation when combustibles appear at 14% CO_2 . An app. is described that analyzes and records the CO_2 present at all times in flue gases, simultaneously detecting and recording the presence and approximate proportion of combustible gases. Actual percentages are rarely less than $\frac{2}{3}$ or more than equal to the amts. recorded. The instrument is driven by water pressure. Gas samples are passed through the filtering system, and then forced through the app. by means of a Hg piston. The gas is passed alternately through two routes, one directly through a KOH tank and the other first through an elec. furnace wherein combustible gases are oxidized to CO_2 and H_2O , and then through the KOH tank. The difference in readings is proportional to the amt. of combustible gas present. In the elec. furnace, the O is taken from the air invariably present in flue gases, or from CuO provided in the furnace. Communicating tubes are used to diminish the lag between the time the gas leaves the flue and the analysis is recorded on the chart. The app. is dirtproof and requires little attention.

W. H. BOYNTON

Gas of today and its manufacture. W. BERTELSMANN. *Chem. Ztg.* 45, 213-6 (1921); cf. C. A. 14, 2407.—B. gives a brief review of the modern processes for increasing gas production, such as steaming of retorts, double-gas and tri-gas processes, producer gas and foul-gas. The latter is obtained from the decompn. of the waste water from straw-board manuf. One cu. m. of waste yields 2 cu. m. of gas of the following compn.: CO_2 24.7%, $\text{O}_2 + \text{N}_2$ 5.5, CH_4 64.3, C_nH_m 0.6, and H_2 4.9, calorific value 5837-6795 cal. One plant has contracted to deliver 120,000 cu. m. yearly. The use is also reviewed of lignite, peat, wood, shale, and sewage residue as sources of gas. J. L. WILEY

Gas of today and its utilization. W. BERTELSMANN. *Chem. Ztg.* 45, 263-6(1921); cf. preceding abstract.—From the user's standpoint, the most suitable gas is a mixt. of coal gas and water gas. Compared with prewar gas, the present grade of gas has a higher density, a lesser need of combustion air, a higher flame temp. and a smaller vol. of combustion products. Generally the tip openings are too small and must be made larger. Tips capable of being regulated are to be preferred. All blue-burners

must have regulators for the primary air. The injector of the burner should, if need be, be supplied with a reducer. The useful length of the mantel should be shortened to about $\frac{1}{2}$ and with the inverted burners the mouthpiece and the mantel should be replaced by shorter ones. Likewise, the useful space in smelting and tempering furnaces should be made smaller. With gas-cooking, the passage should be enlarged and the vessel be brought nearer the flame. Gas-savers of all kinds have no use except with poor burners. Shortening the mantels with a good regulation of gas and air works better and is cheaper than any gas-saver. Throttling of the secondary air or the waste gases by means of gas-savers causes danger from CO poisoning. J. L. WILEY

The therm: Notes and comments. GEO. BRAIDWOOD. *Gas World* 74, 310-13; *Gas J.* 154, 90-2(1921).—An approval of the terms of the Gas Regulation Act of 1920.

J. L. WILEY

Gasification of powdered coal. A. E. BOURCOUD. *Chem. Met. Eng.* 24, 600-4 (1921).—A consideration of the velocity with which reaction takes place between producer gas and suspended C, using the results for estg. a proposal for gasifying powdered coal or oil. Previous attempts to gasify powdered coal have not been satisfactory; the gases had approx. the heating value of blast-furnace top-gas, containing a high % of CO, and partially decomposed hydrocarbons, having a relatively low calorific value when cooled, and keeping a great part of the original powdered coal in suspension as powdered coke. The problem is to convert ordinary coal and oils completely into an ideal gas without leaving unconsumed C, and to regulate the time and temp. necessary for the reaction to be completed. B. shows that complete reduction cannot be obtained unless the last traces of the first products of combustion react with the last traces of C in suspension at a temp. well above equil., in general 1100-1150°. Neither can this be done without the addition of preheated primary air, from 400 to 560°. In those examples representing the best results, a temp. of 1700-1800° has been reached in the combustion chamber, the total time for the reaction being 6 to 7 sec., including combustion period of 1 sec. B. has designed a proposed producer which should meet in practice the theoretical conditions shown. Computations arrived at suppose a temp. of 1800°, decreasing to 1220° at the end of a 4 sec. reaction period with 97% of the products reduced, leaving only 4 kg. of the total charge of 253.3 kg. of the C in suspension. The compn. of the gas should be: CO 31.5, H₂ 12.8, CO₂ 0.2, H₂O 0.3, N₂ 55.2%; its total vol. at the end of the reaction 22,000 cu. m. J. L. WILEY

Complete gasification. W. D. WILCOX. *Gas Record* 19, No. 8, 37-8(1921).—Gas of the future will be combination coal and water gas made in one unit and at one operation rather than by the carbonization of coal in by-product ovens and gasification of the coke in independent water-gas generators (Harper, C. A. 15, 938). Plants of the Strache or Tully types are satisfactory for such a process. Cf. C. A. 14, 3147; 15, 588). J. L. WILEY

Rincker-Wolter complete gasification process at Utrecht. ANON. *Gas World* 74, 271(1921).—One of the three Rincker-Wolter producers has been replaced by a Rincker residueless producer of the same capacity, 350,000 cu. ft. per day. Two producers are coupled together; in the one, water gas is formed from coke and the gas is led, at a temp. from 1000 to 1200°, through fresh coal in the other. This is carbonized to coke; then the system is reversed, water gas being made in this 2nd producer and passed through the first charged with fresh coal. The coke is completely gasified by alternate blowing of 3 min. and steaming for 4 minutes. Per 24 hrs., there were produced 9885 cu. m. of gas having a heating value of 324 B. t. u. per cu. ft., using 4,742 tons of coal and 1,208 tons of coke. The gas analyzed CO₂ 7, C₂H_{2n} 0.6, O 0.5, CO 32.8, CH₄ 2.3, H 49.4 and N 8%. The efficiency is about 65%. This process effects a considerable advance in the recovery of heat units in the gas produced over the former method. J. L. WILEY

Low-temperature carbonization of coal. STEWART J. LLOYD. *Am. Gas J.* 114,

353-4, 363-4(1921).—A very brief review of developments in this field. Cf. *Armstrong, C. A.* 15, 1204.

J. L. WILBY

Low-temperature carbonization in Germany. A. TENBOSCH. *Het Gas; Gas World* 74, 273(1921).—There are at present more low-temp. producers of the Mond type in Germany than in the rest of the world put together. (Cf. *Trenkier, Roser, C. A.* 15, 1388). The low-temp. process originated with Kerpeley in 1903; it works well with all kinds of material and gives a good yield of gas with a high heating value. The ash and slag are automatically removed. The tar contains a high % of oils and lubricants; the temps. do not exceed 930° F. but the heating surface must be large; so ordinary retorts will not do. A type developed by the Berlin Mond Gas Co. restricts the period of distribution to 2 or 3 hours, the gases themselves being applied to heating the retorts. The gas has a heating value of from 146 to 152 B. t. u. per cu. ft. and a temp. of 750° F.; it is, therefore, useful for the same purposes as producer gas made without tar recovery. The tars contain 25-30% of pitch with a low m. p.; they are not black but brownish red. They contain from 1/3 to 1/2 of lubricants, the rest being good motor fuel; resinous compds. are practically absent. The paraffin content ranges from 1% with coal to 17% with lignite. The annual cost of a 100-ton-per-day plant, including interest and depreciation, is about 450,000 marks. The yield in tar is 1500 tons per yr. at 2500 marks per ton.

J. L. WILBY

Smith continuous system of carbonization. GEO. H. THURSTON. *J. Soc. Chem. Ind.* 40, 51-6T(1921).—5 Figs. The Carbocoal process is described (cf. *C. A.* 12, 1594; 14, 3519). Results are given of tests at the plant of the International Coal Products Corp., Clinchfield, Va. on 35 various coals and lignites ranging in analyses as follows: volatile 26.20 to 45.20, fixed C 41.5 to 65.38, ash 4.98 to 23.75%, B. t. u. 11055 to 14786. The semi-carbocoal analyzed from 7.3 to 15.92% volatile; 50.89 to 82.87% fixed C; 7.68 to 36.6% ash; and 9448 to 13772 B. t. u. The carbocoal analyzed from 1.28 to 8.17% volatile; 60.44 to 89.52% fixed C; 8.3 to 33.92 ash; and 9798 to 13651 B. t. u. The yields per short ton of coal were: carbocoal from 1248 to 1999 lbs.; tar 16.52 to 39 gal.; (NH₄)₂SO₄ 13.66 to 24.7 lb.; light oil 0.65 to 2.84 gal.; and gas 6612 to 13452 cu. ft. with 525 and 391 B. t. u. resp. The carbocoal compares very closely to its coal for heating furnaces; in a B. and W. Boiler 1 lb. of carbocoal evapd. 9.09 lb. of water as against 9.59 lb. by the coal from which it was derived. It is also useful for locomotive fuel and for the blast furnace. Its av. crushing strength was found to be 9.43 lb. per sq. inch at 1400° and 944 lb. at ordinary temperature. Benzene and toluene can be produced from the tar by a cracking process.

J. L. WILBY

Water gas operation. GEO. E. WAGNER. *Gas Age* 47, 271-4(1921); *Gas Record* 19, No. 7, 21-3(1921).

J. L. WILBY

Position of the ascension pipe. II. G. E. FOXWELL. *Gas World* 74, No. 1915, (Coking and By-products Sec.), 11-12(1921); cf. *C. A.* 15, 1068.—F. replies to Johnson (*C. A.* 15, 1391).

J. L. WILBY

Some results with a Tully plant. H. RULE. *Gas World* 74, 313-4(1921); *Gas J.* 154, 92-4(1921); cf. *C. A.* 15, 588.—Further results but with low-grade fuel are given. The CO₂ content of the gas was higher, and a lower production of gas resulted, about 26,000 cu. ft. per 8-hr. shift in contrast with 51,000 cu. ft. with good coal. There is a considerable reduction of plant efficiency and capacity, with increased wear on the brickwork, increased wages, and a larger amt. of ash and clinker to be disposed of. The low cost of the fuel is attractive.

J. L. WILBY

The Goffin process. L. STOCK. *J. Gasbel.* 63, 833-5(1920); *Gas J.* 153, 804-5(1921).—The process is connected with the steaming of horizontal retorts. Its chief characteristics are: an increased efficiency of retort settings; economy in wages; utilization of waste heat and a part of the heat units in the coke; and simultaneous production of water gas in which point lies the importance of the process. In making coal gas,

225 B. t. u. of heat must be supplied per cu. ft. but water-gas requires only 60% of that amt. With horizontals, steaming can be started within a few minutes after charging and with this process steam of low tension can be used. The retorts are charged as full as possible, the gas passing off without degradation through the small open space at the top of the retort. The retorts are not adversely affected by the steaming process; in fact it is assumed that their durability is increased.

J. L. WILEY

Relation between the utilization of the heat from the waste gases and chimney draft. L. SROCK. *Gas und Wasserfach* **64**, 33-4(1921).—S. discusses the subject theoretically and concludes that in general waste gases leave the plant at too high a temp. and that a rational utilization of this waste heat does not interfere with the chimney operation.

J. L. WILEY

Inspection and maintenance of gas-works plant. J. H. DARRAH. *Gas World* **74**, 269-271(1921).—The inspection and maintenance of gas-works plants is more and more tending towards specialist organization and direct supervision. D. outlines a system for classifying and keeping a record of plant inspection. For maintenance of structural steelwork and for protection against corrosion, painting with silica-graphite paints has given the best results although it is not a cure. The best prep. for protection against corrosion, especially that occurring in purifier covers and lutes, has been periodically washing them with the spent paraffin oil from the naphthalene washers. Where trouble has been experienced with purifying, due to the poor quality of the oxide, some relief has been found by mixing 2% of soda ash with the oxide and putting the clean box on as the primary one in the series. In a few hours, all the other boxes behind it have been cleaned. As a means for avoiding boiler corrosion, D. recommends the lime-soda method of softening boiler water as described by Paul in "Boiler Chemistry and Feed Water Supplies."

J. L. WILEY

Removal of sulfur compounds. ERWIN C. BRENNER. Univ. of Wisconsin. *Am. Gas. J.* **114**, 339-40, 348-9(1921).—Hypochlorites were investigated as agents for the oxidation of S compds. in carbureted water gas. It was found that NaOCl in aqueous diln. as low as 0.0706 g. of available Cl per l. is capable of completely removing H₂S in a gas if bubbled through the liquid. A loss of Cl by the NaOCl soln. can be prevented by making the soln. slightly alk. with NaOH without removing a large part of the CO₂ of the gas. Some of the S as H₂S is oxidized to sulfate. Tests were also made on removing CS₂ and fixed S compds. with solns. like those used above. It was found that CS₂ and fixed S compds. could be removed by NaOCl solns., the removal being found to vary directly as the intimacy of contact between the gas and the absorbent. Removals as high as 46% were made. A reasonable variation in the amt. of NaOCl in the solns. has but little effect on the amt. of S removed. Also in *Gas Age* **47**, 315-8(1921).

J. L. WILEY

Conservation of waste heat in gas works. ANON. *Gas. J.* **154**, 145-7(1921).—Installations at Brentford and Southall are described. In the former incandescent coke is fed from the inclined retorts directly into the H. and G. blue water-gas generator and a H. and G. waste heat boiler is operated in connection (cf. Stewart, C. A. **14**, 2252). This raises 90 lbs. of steam per 1000 cu. ft. of gas made, or 20 lbs. more than are required for the operation of the blue gas plant itself. At Southall, two such boilers are installed.

J. L. WILEY

Solutions of acetylene in acetone at high pressures. RAYMOND R. BUTLER. *J. Soc. Chem. Ind.* **40**, 25-6T(1921).—An app. and a method for detg. the increase in vol. of acetone in which C₂H₂ is dissolved at pressures up to 145 lbs. per sq. in., are described. At 15.8° the vol. increases linearly, the value of the vol. increase per atm. being 4.4%. The detns. agree with, and extend to higher pressures than, those of Claude and Hess (*Compt. rend.* **124**, 626).

W. F. FARAGHER

New cutting gas, calorene, with fine properties. ANON. *Brass World* **17**, 111-2

(1921).—"Calorene" is composed of unsatd. H-C gases containing *in summa* 86% C and 14% H. It possesses a high rate of combustion, a high C with a min. proportion of slow-burning gas, and a heat value of 1580 B. t. u. (87.8 cal.) per cu. ft. (0.0283 cu. m.). While the consumption of O per cu. ft. of metal removed increases with the thickness of the metal, the labor and consumption of calorene decrease. A cylinder containing 210 cu. ft. (5.94 cu. m.) of calorene weighs 85 lbs. (38.55 kg.), compared with 250 lbs. (113.4 kg.) for C_2H_2 . The kerf or slot scale of some gases is very hard while that of calorene is about 0.008" (0.2 mm.) thick on a 4" (101.6 mm.) cut, with undisturbed hardness as detd. by scleroscope and file. The gas may be compressed to 3500 lbs. (1587.6 kg.) per sq. in. (6.45 sq. cm.) and stored as free gas without filler. It may be brought in contact with oil and grease without danger of explosion, it works at low temp. and its combustion point is about that of illuminating gas. Relative heat values and chem. compns. are tabulated for C_2H_2 , calorene, gasol, Blau gas, and H.

W. H. BOYNTON

Temperature control of by-product ovens. D. R. W. *Gas World* 74, No. 1915, (Coking and By-products Sec.), 12-13(1921).—Heat regulation in oven walls by means of pyrometric readings is discussed. It is the only correct means for detecting temp. changes and avoiding irregular working.

J. L. WILEY

Naphthalene. A. MAILHE. *J. usines à gaz*, 45, 81-3(1921).—M. reviews the compn., production, hydrogenation, and some of the uses of $C_{10}H_8$.

J. L. WILEY

Distillation of ammoniacal liquor for the manufacture of liquor ammonia. WILFRED WYLD. *Chemical Age* (London) 4, 358-60(1921); *Gas World* 74, No. 1915, (Coking and By-products Sec.), 13-15(1921).—Practically complete decarbonation of ammoniacal liquor with a negligible loss of NH_3 can be effected by simply preheating the liquor by means of the spent liquor from the still and by waste heat, and then spraying it into an empty column under a small pressure, no steam being used. More efficient and more economical working of the bubbler type of still can be obtained by raising the bubbling hoods so that the steam instead of bubbling through a 2-in. seal is able to sweep the surface of the liquor in the troughs. A certain amt. of reabsorption is thus prevented, a considerable saving in steam is effected, and a less dila. of the liquor results. There are also advantages in working under a vacuum by reason of the partial pressure of NH_3 in the vapor being decreased, and thus a greater tendency for the gas to be liberated. In this case exhaust steam can be used, thus lowering this item of cost. In producing a dry NH_3 gas or one nearly so, condensation is generally carried too far, that is the vapors are cooled below the temp. necessary for condensation of the water vapor and to maintain the NH_3 in the gaseous state, with the result that about 40% of the original NH_3 of the raw liquor has to be returned to the still for redistn. and a large amt. of extra fuel used. Better results can be obtained by slowly cooling the vapor to the dew point, and thus sepg. the NH_3 from the water, since the vapor pressure of NH_3 is higher than that of water. W. has designed a still covering the above features whose operation has given very encouraging results.

J. L. WILEY

Production of sulfate of ammonia from coal, with a description of the works of the Natal Ammonium, Ltd. OSCAR LAZAR. *J. S. African Assoc. Anal. Chem.* 4, 13-27(1921).—The plant is a complete working unit in itself with mine, producers, acid-house, etc. The producers are of the Mond type, 18 in number. The coal is a non-coking semi-anthracite and contains 2.2% of N. The yield of $(NH_4)_2SO_4$ per ton of coal is about 155 lbs. or a recovery of about 67% of the total N. Sulfate is the chief product, the tar being of small amt. and of inferior quality. Except for the gas used to heat the plant and furnish electric power, the gaseous products are wasted.

J. L. WILEY

Alcohol, a new by-product of the distillation of coal. E. DE LOISY. *Rev. métal* 17, 56-62(1920).—This is mainly a reprint of an article by Bury and Olland (C. A 14, 826).

C. C. DAVIS

Distil tar at its source. BURTON DUNGLINSON. *Gas Record* 19, No. 8, 31-6(1921).—Gas and coke-oven plants should distil their own tar and thus add to their profits. D. describes the Hird continuous tar plant (cf. *C. A.* 14, 339) with by-product recovery equipment, and presents considerable data on its operation. Total cost of distn. for a 20-ton per day plant is \$2.57 per ton, and for a 100-ton plant \$1.00. A 24-hour operation test with a 20-ton still, using Penn. coke-oven tar, gave the following results: Amt. of tar distd. 5414 gals., light oil recovered 250 gals., middle oil 659 gals., creosote oil 1066 gals., anthracene oil 377 gals., pitch 2952 gals., loss 130 gals. or 2.4%, gas used 42100 cu. ft. coke-oven gas with B. t. u. value of 570, cu. ft. gas per ton of tar 1598, sp. gr. of tar 1.167, m. p. of pitch 143° F.

J. L. WILEY

Laboratory distillation of coal tar. H. D. BELL. *J. S. African Assoc. Anal. Chem.* 4, 8-10(1921).—To obtain a more careful and exact fractional distn., a special Cu retort is used. It has the advantage over a glass retort of an easier control of temp., preventing the breaking up of the products of distn., slight danger of fire and repeated use of the same retort. The retort is placed inside a sheet-iron hood to prevent variations in temp. from contact with the air. It is heated by a Bunsen flame slowly up to 100° to avoid bumping and frothing and then more rapidly, the different fractions being condensed and received in weighed receptacles. Comparative results of distn. in this retort and a glass retort are, resp., in %: H₂O 0.1-1.0, light oil to 170° 1.1-2.8, carbolic oil (170-230°) 11.0-17.8, creosote oil (230-270°) 13.5-6.3, anthracene oil (270-290°) 3.6-5.0, anthracene oil (290-310° with steam) 14.6- —, pitch 55.2- —, (anthracene oil 290-310° + pitch in the glass retort = 65.9), loss 0.9-2.3.

J. L. WILEY

Estimation of water in tar. ANON. *Gas und Wasserfach* 64, 71-3(1921).—Samples should be taken either as the tar flows into the tank cars or from the tanks themselves in order to obtain a fair sample, which should then be thoroughly agitated before analysis. Three methods may be used for estg. the water content: fractional distn., vacuum distn., and Beck's method (*C. A.* 4, 158). With the first method water, naphthalene wash-oil and benzene wash-oil are estd. in one operation. The tar is distd. in a Cu flask provided with a Liebig condenser until the oil distillate is free from water, about 200°, and the vol. of water is read off directly in a graduated cylinder. By adding 10% xylene and some pumice stone to the tar, the distn. is aided and bumping prevented. By carrying out the distn. under vacuum, decompn. of the tar is reduced. Frothing, however, renders this method somewhat difficult to operate. The tar is first heated until it boils under ordinary pressure, and then the distn. is carried out without further heating by increasing the vacuum gradually to about 700 mm. Beck's method is more rapid and gives results which agree very closely with those obtained by fractional distn.

J. L. WILEY

Modern practice in the coal-tar industry. C. BERTHELOT. *Rev. métal.* 17, 63-92 (1920).—This article traces the progress of the coal-tar industry in the last 50 yrs. It includes markets, prices, production, and a detailed description of the individual chem. products obtained from coal-tar. Chem. methods and the engineering installations now used in France are outlined with many diagrams. *Ibid* 169-201.—A continuation of the discussion of chem. processes covering the various methods of distg. coal tar, and of collecting the products. Treatment of the heavier oils is next outlined, with methods and app. for working them up. *Ibid* 252-74.—A treatment of the distillates with description and diagrams of the Ray, Lenhard and other systems. *Ibid* 335-50.—A discussion of the processes for purifying C₁₀H₈, the manuf. of C₁₀H₁₀, the prepn. of sol. antiseptics, together with data on steam and water consumption, personnel and plant conveniences. This is in effect a treatise of the industry. The chapters are replete with diagrams.

C. C. DAVIS

Sulfur in benzene. ANON. *Chem. Trade J.* 68, 304(1921).—The app. used for

detg. S consists of a U-tube loosely packed with cotton wool and suspended in a beaker partly filled with water. One arm of the U-tube is connected to one limb of a Y-tube, the second limb of which is connected to a wash bottle containing NaBrO. The third limb leads into a silica tube packed with platinized quartz. The outlet tube is connected with two wash bottles containing NaBrO. A current of air is drawn through the app. For analysis the silica tube is heated to redness over 4" of its length. The taps of the U-tube are opened and the vacuum is adjusted to give a steady stream of air through the app. The tap nearest the silica tube is closed and the other one removed to permit the addition of 2 cc. of C_6H_6 from a standardized pipet. The cap is replaced in the open position and the tap nearest the silica tube opened slightly. The combustion is continued until the platinized quartz ceases to glow when the taps are wide open. The water in the beaker is heated to boiling and the combustion continued to the complete oxidation of the C_6H_6 . S is pptd. as $BaSO_4$ from the contents of the wash bottles in the usual manner.

W. H. BOYNTON

Standardization of coking plants. O. M. SCHADECK. *Stahl u. Eisen* 39, 1349-50 (1919).—The necessity of standardization of existing coking plants is discussed. No actual standards are suggested, but S. recommends the standardization of pipes, dampers, arches, and the like, and the construction of standard units in new plants. J. S. C. I.

Distilling mineral oils, tar, etc. (Brit. pat. 156,539) 22.

DOWSON, J. EMERSON AND LARTER, A. T.: *Producer Gas*. 4th Ed. London and New York: Longmans, Green & Co. 361 pp. \$7.50.

Finding and Stopping Waste in Modern Boiler Room. Philadelphia. H. S. B. W. Cochrane Corp. 413 pp. For review see *Textile World* 59, 37(1921).

FLEISCHER, HERMANN C.: *Die Stickstoffbestimmung in Kohle und Koks*. Halle (Saale): Wilhelm Knapp. 40 pp. M 5.85.

GRAHL, C. DE: *Wirtschaftliche Verwertung der Brennstoffe*. 2nd Ed. revized. München and Berlin: R. Oldenbourg. 487 pp. M 110.

MÜNZINGER, FRIEDRICH: *Kohlenstaubfeuerungen für ortsfeste Dampfkessel*. Berlin: Julius Springer. 118 pp. M 24. For review see *Stahl u. Eisen* 40, 1756(1920).

MUHLERT, FR. AND GWOSDZ, J.: *Die Leuchtgas und Wassergasindustrie*. Halle (Saale): Wilhelm Knapp. 134 pp. M 14.60, bound M 18. A monograph.

SCHNELL, EUGEN: *Betriebserfahrungen mit Braunkohlen- und Generatorteeeren*. Falkenstein: Emil Haugk. 65 pp. For review see *Brennstoff-Chem.* 2, 80(1921).

SPILKER, A.: *Kokerei und Teerprodukte der Steinkohle*. 3rd Ed. revized and enlarged. Edited by O. Dittmer and R. Weissgerber. Halle (Saale): Wilhelm Knapp. 142 pp. M 13.60, bound M 17.20. A monograph.

Fuel. R. MATSUNAGA and S. AOKI. Brit. 157,007, March 8, 1920. Coal dust, coke waste, brown coal, or the like is washed with H_2O , pulverized, and mixed with caking bituminous coal, also pulverized, the pulverization being effected in such a way that both ingredients are powders of a uniform degree of fineness. The mixt. is moistened with H_2O , molded into briquets, and roasted in an oven. A house fuel, intended to be smokeless and odorless, is produced in the same way except that the coal dust, coke waste, etc., is roasted after being washed. The amt. of coal dust, coke waste, etc. used is not more than two parts and that of the bituminous coal one part.

Treatment of coal. H. PLAUSON and J. A. VIELLE. Brit. 156, 138, Dec. 31, 1920. *Montan wax* is extd. from bituminous coal by highly dispersing the latter in hot H_2O , preferably in the presence of small quantities of emulsifying agents, such as 1-10% of NaOH, soaps, lysalbinic or protalbinic acid or alkali protein compds., or 1-5% of solvents such as benzene, benzine, pyridine, acetone, or alc. After removal of coarse

impurities by filtration, the dispersion is treated with small quantities of salts or acids and allowed to settle. To obtain the montan wax from the resulting sludge, the latter may be heated in an autoclave to 110–130° with 10–30% of a solvent of the wax, or it may be dried and distd., preferably *in vacuo*, with superheated vapors of solvents, such as petroleum, aniline, toluene, xylene, or benzene, or the wax may be salted out from the sludge by heating the latter to 110–130° with 2–5 times its vol. of a concd. soln. of a neutral salt or of a substance like naphthalene which dissolves montan wax while hot. The residue, consisting of finely divided coal, may be used as a coloring agent or made into briquets.

Bituminous substances from coal. RÜTGERSWERKE, Akt.-Ges. Ger. 320,056, Aug. 10, 1918. See Brit. 131,588 (C. A. 14, 340).

Extraction of hydrocarbons from coal. H. PLAUSON and J. A. VIELLE. Brit. 156,123, Dec. 30, 1920. A mixt. of SO₂ and a ketone, such as acetone, is used for the extn. at ordinary temps. of hydrocarbons from coal and for the sepn. of unsatd. from satd. hydrocarbons. Other ketones which may be employed are MeEtCO, Et₂CO, MePrCO and EtPrCO. The extn. may take place under pressure. According to examples: (1) Acetone is satd. with SO₂ and allowed to remain at atm. temp. and pressure in contact with pieces of hard coal; by steam distn. of the reddish liquid produced, a yellow oily hydrocarbon is obtained. Increasing the pressure gives a larger yield of the product; an app. is described in this connection. (2) The extn. of lignite or bituminous brown coal with the acetone-SO₂ mixt. yields a resinous wax-like substance, which apparently results from the action of the SO₂ on the lignite and the soln. in the acetone of the product. The lignite may previously be treated under pressure with alcoholic or aq. caustic alkali and the residue after evapn. used for the acetone-SO₂ treatment. (3) Crude naphtha, when extd. with the acetone-SO₂ mixt., seps. into 2 layers, the clearer of which, after evapn. of the acetone and SO₂, yields unsatd. hydrocarbons; the paraffin hydrocarbons remain in the other layer, being undissolved by the acetone-SO₂ mixt. (4) The acetone-SO₂ mixt. is used for absorbing diolefins, and thereby sepg. them from other hydrocarbons employed or produced in their manuf.; an addition product of the diolefin and SO₂ is apparently formed at ordinary temps., and this splits up on heating.

Peat. D. B. MACDONALD and DENSIFIED PEAT, FUEL & PRODUCTS, LTD. Brit. 155,895, Sept. 20, 1919. Blocks of peat are prepd. by pulping and reducing peat in a natural or wet condition to a homogeneous mass, then compressing it to dispel the air contained therein, cutting the mass into blocks and drying them. The compression may be effected by forcing the peat through a reduced aperture. Drying may be carried out in a hot air chamber or a hot chamber filled with steam, care being taken to prevent cracking of the surfaces of the blocks. Cf. 1216, 1873, 3536, 1877, 6704, 1887, 25,627, 1897, 2859, 1901 and 8153, 1902.

Gas producers. GEORGS-MARIEN-BERGWERKE UND HUTTEN-VEREIN AKT.-GES. Brit. 156,168, Dec. 31, 1920. Fe is added to the charge in a gas-producer to prevent premature cooling and solidification of the slag.

Gas producer. W. CLIMIE. U. S. reissue 15,057, Mar. 8. See original pat. 1,040,148 (C. A. 6, 3512).

Apparatus for electrical precipitation of suspended particles from gases. A. F. NESBITT. U. S. 1,371,995, Mar. 15. The app. is adapted for removing tar from gas.

Separating creosote from tars, mineral oils, etc. E. ERDMANN. Brit. 156,694, Jan. 7, 1921. Addition to 156,594. Phenols are extd. from tars such as lignite, shale, peat, coal, producer and low-temp. tars, and from tar distillates and residues and from mineral oils and distillates by washing with a mixt. of acetone and H₂O. Acetone exts. of the tars, etc., may be mixed with H₂O or aq. acetone to cause the sepn. of the oils, while the creosote remains in soln.

Quenching coke. A. FRANKEL. Brit. 157,042, Sept. 1, 1920. A receptacle for incandescent coke adapted to be lowered into a quenching-trough is protected from wear by having flat iron bars with distance-pieces bolted to its interior surface to form a grate-like member. The bars are cooled on three sides by air circulation and are readily interchangeable. A suitable construction is specified.

Regulating the quality of coke. WALTER L. GRAUL. Can. 210,781, Apr. 19, 1921. The quality of coke is regulated by adding to the coal to be coked such a proportion of dry pitch or coke breeze as will correct the excess or deficiency of the coking substance in the coal and such additional amt. of pitch and breeze as will give to the coke the desired toughness and hardness.

Construction of retorts, coke ovens and the like. R. W. EASTON. Can. 210,558, Apr. 19, 1921. A retort has intermeshing propelling or feed screens which are revolvable together in a casing, a furnace for heating the casing, charging and discharging means at opposite ends of the casing, means for drawing off the gases and gearing to rotate the screens.

Coke oven. C. E. LUCKE. U. S. 1,371,315, Mar. 15. Structural features.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The shale oil industry. I. LAZENNEC. *L'Age de fer*. 37, 931-3(1921).—Brief description of the mode of occurrence and methods of extrn. and distn. of shale, and of the products of distn. and their method of purification. A. P.-C.

A convenient and reliable retort for assaying oil shales for oil yield. I. C. KARRICK. Bur. Mines, *Repts. Investigations* No. 2229, 6 pp. & cut (1921).—A retort for detg. the oil yield from oil shales is described. It is convenient and accurate for rapid assays in the field or lab. and gives an agreement between duplicates of 2% when the oil yield is detd. volumetrically, and 1% when detd. gravimetrically. The amt. of oil by this method minus 2 gals. per ton is the quantity that will be obtained under careful operation with the Scotch lab. assay retort. For details of the retort, its operation, oil measurement and calcn. of results the original must be consulted. H. S. BAILEY

Use of the critical temperature of solutions of aniline for the complete analysis of gasoline. C. CHAVANE and L. J. SIMON. *Ann. chim. anal. chim. appl.* 3, 87-9(1921). See C. A. 13, 2125; 14, 117.

Critical temperature of solution (T. C. D.) in aniline of mixtures of hydrocarbons. Application to the analysis of petroleum distillates. N. CHERCHEFFSKY. *Ann. chim. anal. chim. appl.* 3, 53-5(1921).—A claim of priority for methods and detns. described by Chavanne and Simon (C. A. 14, 117). According to C. this subject had been published previously (cf. C. A. 5, 2486; *Compt. rend.* 1910, 1338) and *Determination d'un naphte* by Dunod and Pinat (1919). C. C. DAVIS

The properties of paraffin. ANON. *J. pétrole* 21, 3, 7(1921).—The coeff. of expansion by heat of solid paraffin from petroleum is between 0.000842 and 0.005108. Paraffin obtained from lignite tar has approx. the same value but in the molten state the value is almost double. The variation of the sp. gr. in the case of solns. of paraffin in solvents of high d. would be expressed by the rule of mixts. but in the case of solvents of low d., one observes certain irregularities in the neighborhood of the point of fusion. The d. of solns. at temps. above the fusion point of paraffin may be approx. calcd. by the rule of mixts. R. L. SIBLEY

The production of artificially dense charcoal. L. F. HAWLEY. *J. Ind. Eng. Chem.* 13, 301-2(1921).—By distg. briquets of hard-wood sawdust under mechanical pressure there was made on a small scale a charcoal having an apparent density (A. D.)

of 0.62 and a chloropicrin-absorption value (C. P.) of 700. Incomplete work with a commercial-sized unit gave A. D. = 0.58 and C. P. = 600. A standard coconut-shell charcoal shows A. D. = 0.63 and C. P. = 900.

JEROME ALEXANDER

Composition of natural and artificial asphalts. J. MARCUSSON. *Mitt. Material-prüfungsamt* 36, 209-30(1918); cf. C. A. 11, 1291; 12, 2436.—*Natural asphalts.*—The asphaltogenic acids in natural asphalts are brown tarry products containing variable proportions of S. They form sparingly sol. Na salts. By long-continued heating at 200° they are converted into anhydrides, while at higher temps. substances resembling asphaltenes are formed. Asphaltogenic acids from Trinidad crude asphalt closely resemble the acids obtained by heating Texas petroleum oil in the air. In the true asphalts the amt. of asphaltenes is less than that of the petroleum resins and oily substances together. For example in the case of Trinidad asphalt it was 37% as against 54% of oil and resin, and in Bermuda asphalt 35.3% as against 53%. The proportion of mineral matter also influences the character of natural asphalt, increasing the firmness and giving a matt surface, while pure bitumens show a polished surface. The mineral matter in Trinidad asphalt ranges from 33 to 55%. *Fat distillation residues.*—The S compds. in the residues from the distn. of fats, unlike those in natural and petroleum asphalts, are not pptd. by HgBr_2 soln., and this reaction may be used for detecting petroleum pitch in fat pitch. The following table shows the compn. of typical fat pitches:

	M. p. (Kramer- Sarnow) °C.	Free acid value.	As oleic acid. %	Sapon value.	Total saponifiable constituents. %
Stearin pitch (a)	74	25	13	102	87
Stearin pitch (b)	41	23.1	11.6	55	38
Stearin pitch (c)	—	17.2	8.8	50	24
Wool-fat pitch	33	6.5	3.3	41	29

The test of Donath and Margosches will show whether a fatty acid or wool fat distn. residue is present: 10 g. of the sample are boiled for 30 min., beneath a reflux condenser, with 50 cc. 0.5 N alc. alkali: if a cryst. deposit is formed above the insol. pitchy constituents the presence of wool-fat pitch is indicated. The cryst. substance consists, not, as supposed by Donath and Margosches, of a cholesterol compd., but of the alkali salts of hydroxy acids. A so-called "pitch-gum" prepd. by heating a fat distn. residue with about 10% of H_2SO_4 or HNO_3 at 240-50° (Ger. pat. 817,299), to obtain an elastic mass, consisted of 65% saponifiable matter, mainly oxidized fatty acids, while the unsaponifiable matter was a heavy oil. Asphaltenes were not present. An elastic insulating mass made by heating stearin pitch with S at about 155° (Brit. pat. 3045(1894)) contained 35% of substances sol. in CHCl_3 . The sol. portion was a soft pitch with an acid value of about 10 and contained 66% of saponifiable substances. It contained S, but did not give the HgBr_2 reaction of natural and petroleum asphalts. The insol. portion consisted of about 25% of saponifiable matter, the remainder being BaSO_4 added as a filling material. *Coal-tar pitch.*—A sample of hard coal-tar pitch contained: Substances insol. in CHCl_3 , 27; benzene-soluble tar resins, 21; CHCl_3 -sol. tar resins, 4.5; pyridine-sol. tar resins, 2.5; phenols, 1; and hydrocarbons and neutral substances, 44%. The resins of coal-tar pitch sol. in benzene and CHCl_3 melt when heated, whereas those sol. in pyridine swell up like the asphaltenes of natural asphalt. All 3 consist largely of C, with some H and O, together with traces of S, but no N. When heated with strong H_2SO_4 they yield water-sol. sulfo acids, whereas petroleum resins and asphaltenes form insol. acids. They also yield sparingly sol. formolites on treatment with H_2SO_4 and CH_2O . The I value of the resins sol. in benzene and CHCl_3 is about 28 (approx. the same as that of asphaltenes). On treating the benzene soln. of the resin with an ethereal soln. of FeCl_3 a dark ppt. of a double compd. of the resin and FeCl_3 is produced; it is sol. in pyridine. Similar ppts. are given by petroleum resins and asphaltenes. When the benzene soln. of the benzene-sol. resin is heated to 100-10°

the color changes from red-brown to deep brown or black, and a large proportion of the resin becomes insol. in benzene and in CHCl_3 . On this reaction depends the resinification of coal tar. The insol. constituents of coal tar, which consist mainly of elementary C, also contain tar resins. Coal comes nearest to the pyridine-sol. resin in color, soly., and elementary compn., while the CHCl_3 -sol. resin is intermediate. The reactions of the coal tar resins, and the behavior of their nitro derivs. points to their having a cyclic or polycyclic structure, with the O probably combined in bridge formation. J. S. C. I.

Fatty acids (Brit. pat. 156,141) 27.

COURAU, R.: *Technique des pétroles*. Paris: Gaston Doin. 406 pp. 16 fr. For review see *Bull. soc. encour. ind. nat.* 133, 237(1921).

Fuel oils. A. E. DUNSTAN and F. B. THOLE. Brit. 156,284, July 8, 1919. Heavy viscous oils are rendered suitable for use as fuel oils by heating at about 400° under a pressure of about 200 lbs. per sq. in. for about 1 hr. The lighter oils produced by cracking are allowed to pass off in the form of vapor. By this treatment, the content of asphalt or amorphous hydrocarbons is reduced. The process is applicable to the treatment of petroleum residues derived from asphaltic-paraffin base-oils.

Cracking oils. W. O. SNELLING. U. S. 1,371,268, Mar. 15. A body of oil such as hydrocarbons of high b. p. is maintained at cracking temp. in free contact with a confined body of its own vapors and this body of vapors is compressed during the operation to cause liquefaction.

Cracking hydrocarbon oils. J. W. COAST, JR. U. S. 1,370,881, Mar. 8. Injurious deposition of C on the bottom of a cracking still is prevented by placing a filter within the still and circulating the oil in the still from a perforated intake pipe near the still bottom, through the filter, and thence into the main body of oil in the still.

Continuous production of light hydrocarbons from heavy hydrocarbons. ZELLERT and GMELIN. Ger. 303,235, Oct. 29, 1915. Heavy hydrocarbons, or heavy hydrocarbon residues, are subjected first to a cracking process under slightly increased pressure in order to eliminate substances tending to the formation of coke and pitch, and are then distd. in an autoclave, continuously, under high pressure. Suitable app. is specified, with details of operation.

Chlorinated hydrocarbons. H. PLAUSON and J. A. VIELLE. Brit. 156,139, Dec. 31, 1920. Chlorinated hydrocarbons of low b. p. are obtained by cracking oils of comparatively high b. p. in the presence of Cl or HCl. Steam may be introduced into the reaction; a contact material, such as quartz, porcelain, Pt and like metals, or metallic chlorides, may be present; and the reaction may take place under increased pressure. Specified starting materials are petroleum, mineral oils, solar oil, mazut, tar oils, resin oils, paraffin oil, and Galician or Roumanian gas oils. By elimination of Cl from the products, diolefin hydrocarbons can be obtained. Numerous examples are given.

Distilling mineral oils, tar, resins, etc. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,539, Jan. 5, 1921. Addition to 156,255. In the process of distg. mineral oils, tars, resins, etc., in presence of a catalytic agent which increases the yield of low-boiling fractions as described in the principal patent (1) solid substances, such as asphalt, tar, or pitch, may be treated in the presence of a solvent, which may be in the form of vapor and may be mixed with indifferent or reducing gases; (2) distn. may be effected with steam, which may be superheated and under pressure, and which itself acts as a catalytic agent; (3) the process may be carried out under reduced pressure; and (4) the vapors may be kept in contact with the catalytic material for some time.

Distilling oil from shale. J. H. GINNET. U. S. 1,371,160, Mar. 8. Comminuted

shale is repeatedly picked up and showered by scoops within a heated retort to distil oil from it.

Removing tar from pyroligneous solutions. E. A. BARBET. U. S. 1,371,460, Mar.

15. Tarry matter is extd. from pyroligneous liquor by a selective solvent such as cresol.

Apparatus for recovering light gasoline from natural gas. A. N. KERR. U. S. 1,371,427, Mar. 15. The app. comprizes a compressing and cooling installation for liquefying the gasoline vapor from natural gas, a heat-insulated storage tank for receiving the gasoline from the compressor and a return line from the top of the tank to the compressor.

Treating pyroligneous liquors from wood distillation. E. A. BARBET. U. S. 1,371,461, Mar. 15. Gases and vapors produced in destructive distn. of wood are freed from the greater portion of their tarry content while at a temp. above the condensation point of the AcOH under the pressure employed, the remaining gases and vapors are cooled to condense out a pyroligneous liquor and the gases and vapors are scrubbed to remove their residual MeOH content and leave a gas suitable for use as fuel. The wash liquor is continuously heated and the condensate is also continuously heated to drive off MeOH vapors and after scrubbing the last-mentioned vapors with alkali the vapors from the two heating operations are mixed and MeOH is condensed from the mixt. The previous condensate from which the MeOH was distd. is boiled and vapors from it are brought into contact with alk. material such as lime or soda to produce acetate liquor. The latter is freed from tarry material by treatment with a solvent such as cresol.

Purifying leafy crystalline crude paraffins by sweating. E. BARTUSCH. Ger. 307,625, Aug. 29, 1917. On account of the horizontally lying scale structure of the brown-coal-tar paraffins, free passages must be provided for the adhering oils, soft paraffins, impurities such as creosote and high molecular hydrocarbons imparting color, so that these can pass out of the mass freely from the greatest possible surfaces between the individual scales. The leafy cryst. structure must be produced to the greatest degree throughout the process. Details of operation and control are specified.

Paraffin wax. E. ERDMANN. Brit. 156,693, Jan. 7, 1921. Addition to 156,594. In an app. for sepg. paraffin wax from lignite tar, coal tar, shale tar, etc., by treatment with acetone as described in the principal patent, the tar and acetone are mixed in a closed vessel and are passed through a jacketed cooling and crystg. app. and into a closed vessel. A suitable app. is specified.

Paraffin wax; lubricating oils. E. ERDMANN. Brit. 156,695, Jan. 7, 1921. Addition to 156,594. The method of sepg. paraffin wax and lubricating oils from tars described in the principal patent is applied to the treatment of peat tar. O-containing compds., such as creosote oil, may be removed by washing the tar or the acetone soln. left after sepn. of the paraffin wax with aq. acetone, aq. alc., or other solvent.

23—CELLULOSE AND PAPER

A. D. LITTLE

"Falasco" in the paper industry. G. L. PAVARINO AND G. CASTELLARI. *Staz. sper. agrar. ital.* 53, 32-46(1920).—Falasco is a local name given to certain swamp-vegetation consisting mostly of *Phragmites communis*, various species of *Carex*, *Scirpus*, *Cyperus*, *Typha* and *Juncus*, *Schoenus mariscus*, *Heleocharis palustris*, *Calamagrostis epigaeos*, *Arundo donax*, *Spartanium ramosum*, *Glyceria aquatica* and *Sagittario sagittifolia*. The botanical characteristics of (1) *Carex paludosa*, (2) *Phragmites communis*, (3) *Scirpus lacustris*, (4) *Typha angustifolia* and (5) *Cyperus longus* and the phys. and microscopic characteristics of their fibers are given. The chem. characteristics are

summarized as follows: Vétillard's reagent gives with (1), (3) and (5), blue, with (2) violet-blue and yellow-brown, (4) violet-blue. Iodine-ZnCl₂ reagent gives with (1) violet-blue, with (2) and (4) bluish red with cortical fibers, with (3) pale blue, with (5) greenish blue. Phloroglucinol gives with (1) pectocellulose and with (2), (3), (4) and (5) pectocellulose and lignocellulose. Cellulose yields of 43, 47.5, 45.5, 44.0 and 25%, resp., were obtained by digesting with 24 g. NaOH in 3.1 water for 3 hrs. under 3 atm. pressure 200-g. samples of the plants cut into pieces about 2 cm. long. *Carex* was not sensibly bleached by several hours' treatment with SO₂. After being bleached with KMnO₄, it yielded 31.5% cellulose. Falasco is considered a suitable material for paper making.

ALBERT R. MERZ

Recent research in cellulose industry. CHARLES F. CROSS. *J. Roy. Soc. Arts* 68, 707-712, 721-729, 741-745(1920).—The Cantor lectures. The three lectures deal with: lignocellulose types, cellulose industries, problems of constitution. C. J. WESR

Experiments on wood cellulose. WATSON G. HARDING. Cornell Univ. *J. Phys. Chem.* 25, 201-3(1921).—If wood cellulose is heated at about 100° with a dil. NaOH for a sufficient length of time, the rate of attack becomes very low and may perhaps become zero. With the sample of wrapping paper studied, heating with a 1% NaOH soln. for 25 hrs. left about 60% of the material undecomposed. The NaOH did not decompose all the lignocellulose and may not have decomposed any. An approx. equal decomposition can be obtained by heating for about 6 hrs. with 6% NaOH.

C. J. WESR

The action of hydrazines on cellulose acetates. W. LEIGH BARNETT. Cambridge, (Eng.). *J. Soc. Chem. Ind.* 40, 61-3T(1921).—B. has obtained a series of definite compounds from di- and triacetylcelluloses and PhNHNH₂ and BrC₆H₄NHNH₂ containing N (and halogen) in quantities corresponding with the amounts expected from cellulose acetates calculated by assuming a decomposition of the molecule so that it contained n dextrose residues. The value for n was chosen to fit the particular experiments, however, and varied all the way from 2 to 36. These hydrazones have definite melting points and exhibit the normal characteristics of ketose hydrazones. The experimental method consisted in treating a solution of the acetate with the hydrazine, under different conditions of temperature and time of duration of treatment, followed by removal of the solvent, and excess hydrazine and then exhaustive purification of the product by repeated solution, precipitation, filtration and washing. The solvents employed for the initial solution of the acetate were: PhNH₂, CHCl₃, glacial AcOH, *o*-MeC₆H₄NH₂, PhNO₂, C₆H₅N, and PhOH; the acetate was made from filter paper, cotton wool and cotton yarn. The final products in the case of the phenylhydrazones were amorphous powders, whitish gray to pale yellow or light brown in color, soluble in hot alcohol. A resinous form was also observed. The melting point appears to be associated with the solubility of the compound in alcohol and not with the complexity of the compound, as deduced from the N content. All the hydrazones dissolved readily in acetone. The values for n varied from 2 to 12, depending on the solvent and the acetate used. The melting point varied from 229 to 265°. In the case of the bromophenylhydrazones, the variation in n was from 7 to 36, while the melting point varied from 243 to 287°. Thus the degradation of the complex does not proceed to such an extent as in the case of the phenylhydrazones. This is confirmed by the greater solubility of the hydrazones in alcohol, and the lower melting point. If n is 2, it would seem that the product could be identified.

C. J. WESR

Lignin and the sulfite cooking process. WALTER FUCHS. *Brünn. Ber.* 54B, 484-90(1921).—A criticism of some of Klason's recent work. The structural formula for lignin has not been determined and there is no satisfactory theory of the sulfite process of cooking pulp.

C. J. WESR

Sunflower as a source of paper pulp. RAYMOND FOURNIER. *Papeterie* 43, 242-9(1921).—The sunflower is briefly described, and also its utilization as a source of oil. Lab. tests carried out at the Paris Chamber of Commerce to determine its suitability as a source of paper pulp gave the following results: The stems were cut into small pieces

and subjected to treatment with NaOH and bleaching powder in the usual manner. The NaOH caused a very decided yellowing which could not be removed by bleaching powder; and moreover the mechanical sepn. of the fibers was difficult. The yield of air-dried fiber was 42.6% before, and 34.6% after treatment with bleaching powder. By using a 10% Na_2O_2 soln. instead of NaOH, a whiter and more easily defibered pulp was obtained; it was still, however, quite difficult to defiber. The yield was 48.5% before, and 36.7% after bleaching. Microscopic examn. of the pulp showed that the cellulosic fibers were covered with a lignified tissue. The fibers are 0.640–0.820 mm. long, av. 0.730 mm. The thickness is fairly const. and is about 0.022 mm. More satisfactory results would probably be obtained on a mill scale. Small-scale tests carried out at the mill have shown that sunflower can be treated by means of the existing equipment. The stems were washed, cut into lengths of about 2–3 cm., cooked for about 30 min. in boiling H_2O , crushed between rolls rotating at different speeds, and then cooked (without pressure) with a liquor containing 10–2% NaOH (calcd. on the wt. of the air-dried material). After the cook the material is washed first with hot and then with cold water. The unbleached pulp thus obtained may be used as such, and is decidedly superior to mechanical wood pulp. It may be bleached (but not to a pure white) by the usual methods. The yield varies from 30 to 40% (av. 35%) according to the state of maturity when cut, length of time kept in storage, concn. of cooking liquor, time of cooking, and method of bleaching.

A. P.-C.

Reason for faulty sizing. E. ARNOULD. *Papier* 24, 108–10(1921).—The presence of only 0.043% NaCl in the pulp may completely prevent sizing by the usual rosinalum method. The mechanism of the action is not understood, but depends on the action of the crystalloid NaCl on the colloidal resin. The NaCl must be removed from the pulp. Washing with H_2O is ineffective because the NaCl is adsorbed by the cellulose. Dil. NaOH will dissolve it out and must then be removed completely by very thorough washing.

A. P.-C.

Plants suitable as raw materials for paper making. RAYMOND FOURNIER. *Papier* 24, 116–8(1921).—All plants contain cellulose; but they must fulfill certain conditions to render them economically suitable for the prepn. of paper pulp. The following plants, which are found in large quantities in France or its colonies, are suitable: esparto (*Stipa tenacissima*), bamboo, hemp, flax (*Linum usitatissimum*), jute (*Corchoris capsularis*), wheat, rye, barley and oat straws, papyrus, (*Cyperus papyrus*), phormium (*Phormium tenax*), agave, aloe, reeds, broom (*Spartium Junceum*), nettles (*Urtica urens*), sorghum (*Sorghum vulgare*), maize, sea weed (*Zostera Marino*), and others.

A. P.-C.

Suitability of vine-shoots for the preparation of paper pulp. CH. GROUT. *Papier* 24, 114–6(1921).—Botanically vine-shoots are closely related to wood, and they should be subjected to a treatment similar to that of wood. Lab samples were prepd. by treatment with aqua regia dild. with H_2O . The pulp thus prepd. was composed almost exclusively of cellulose fibers 1–1.75 mm. long and about 0.02 mm. in diam. Com. tests were carried out in 1912 at the Fr. School of Papermaking, Grenoble. Pulping was accomplished by the soda process; the pulp had all the characteristics of a good soda wood pulp. It consisted of ligneous fibers (length 0.5–1 mm., av. 0.8 mm.; diam. 0.02–0.025 mm.) and of bast fibers (length 1.5–2 mm., diam. 0.005–0.02 mm.). It is suitable for the manuf. of fine and ordinary print papers. The treatment is easy and the yield about 30%. France (exclusive of Algeria) produces enough vineshoots to furnish 720,000 t. of pulp a yr.

A. P.-C.

The manufacture of hand-made filter paper. J. BARCHAM GREEN. *J. Soc. Chem. Ind.* 40, 100–1R(1921).—Brief note on the manuf. of filter paper for qualitative work.

C. J. WEST

Determination of methanol in sulfite alcohol (SUGGA) 7. Methylation of cellulose

(DENHAM) 10. Electrolytic recovery of zinc chloride from solutions obtained in washing vulcanized fiber (U. S. pat. 1,371,698) 4.

SINDALL, R. W.: *Paper Technology*. 3rd Ed. revized. London: Charles Griffin Co., Ltd. 337 pp. 12s. net. For review see *Tech. Rev.* 8, 144(1921).

WEICHELT, AUGUST: *Buntpapier-Fabrikation*. Berlin: Carl Hofmann. For review see *Color Trade J.* 8, 65(1920).

WENIGER, K. A.: *Die herstellung von asbestpappe und asbestpapier*. Wien and Leipzig: A. Hartlebens Verlag. M12. For review see *Wochbl. Papierfabr.* 51, 3397 (1920).

Cellulose. M. MULLER and O. HIGGINS. Brit. 156,512, Jan. 5, 1921. In the prepn. of cellulose from ligneous plants and plant fibers, such as jute, hemp, manilla, "cotton," reeds, bamboo, esparto, and the like, the materials are digested with weakly alk. or neutral lye containing 1 part of an alkali acetate and 2 parts of an alkali sulfite under pressure. Other inert salts may be present. The waste liquor may be acidified with H_2SO_4 or $NaHSO_4$, and a mixt. of H_2SO_4 and HOAc boiled off, the residual liquor being evapd. to dryness and incinerated to produce a raw soda lye which may be converted into a mixt. of alkali acetate and sulfite for reuse by adding the mixt. of H_2SO_4 and HOAc boiled off. The waste liquor may be treated with caustic lime and then with $NaHSO_4$, a soln. of NaOAc being obtained and Ca sulfite and sulfate being pptd. H_2SO_4 and HOAc may be obtained from the sulfite and acetate and used for the prepn. of fresh lye.

Fibrous cellulose. C. HARNIST. Brit. 156,777, Jan. 7, 1921. In the prepn. of cellulose and a valuable residual lye, raw cellulosic materials are subjected to the action of NH_3 or other sol. alkali or alkali carbonate and SO_2 in succession or alternately. The material may be subjected to preliminary steaming with or without the addition of alk. or organic solvents in order to remove tannin, resins, etc., useless in fermentation or in fertilizers, and the NH_3 and SO_2 introduced in gaseous form under pressure, with or without the addition of H_2O . The residual lye is neutralized or rendered alk. and subjected to oxidation as by hot furnace gases, or subjected to hot waste gases from S or pyrites furnaces, in towers, with or without the admixt. of catalysts such as thionates, polythionates, and thiosulfates. SO_2 present in combination as sulfolignins, is thus eliminated, NH_3 and alc. are carried off, and the concd. liquor may be subjected to alcoholic fermentation, or used as a fertilizer either alone or admixed with potash salts or other fertilizing substances. Waste lyes from the $CaH_2(SO_4)_2$ method may be similarly treated after first treating them with NH_3 . Where the material is first treated with NH_3 and the liquid is neutralized with SO_2 , substances are pptd. which may be dissolved in turpentine, benzene, etc., and with or without preliminary oxidation by $Ca(OCl)_2$ or $KMnO_4$, may be used for *sizing paper*. Pptn. of these substances may be assisted by the addition of $Al_2(SO_4)_3$. Where SO_2 is used first, its action is moderated by the addition of sacchariferous substances such as molasses, vinasse, or distillery residue. The process is applicable to substances poor in cellulose, such as maize straw, rushes, leaves, etc.

Obtaining cellulose fibers. B. P. EHRENTHAL. Brit. 156,709, Jan. 7, 1921. Easily bleached cellulose fibers suitable as a cotton substitute and usable directly in a cotton spinning mill, and also as raw material for the manuf. of paper, nitrocellulose, etc., is obtained from linseed and hempseed straw, jute, reeds, nettles, agave, potato halm, willow bark and the like. The process comprises three operations: (1) hydrolysis with weak inorg. or org. acids or their acid salts, whereby the incrusting substances (lignin substances, pectose, pectinate of lime, pentose, etc.) are loosened and partly

dissolved, (2) chemical opening, whereby incrusting and cementing or glutinous substances are completely dissolved and the fiber bundles and strands broken up into single cells. Diluted alk. solns. of NaOH, soda, NH_4 compds., milk of lime, and the like are used in boilers, with or without pressure. The boiling operation may be assisted by adding small quantities of org. solvents such as alc., CS_2 , acetone, petroleum hydrocarbons and the like, which may afterwards be recovered and used again. The material is thoroughly washed, and to maintain the single cell fibers in easily separable condition when dry they are subjected to (3) a treatment with oleic and fatty acids or their salts, organic sulfonic acids, amides of fatty and oleic acids, and the like, used in aq. solns. or emulsions, which may be warmed. The fibers so produced are flexible and soft. This (3) treatment may be applied to fibrous material which has been opened by other processes.

Obtaining cellulose fibers. B. P. EHRENTHAL. Brit. 156,710, Jan. 7, 1921. In the prepn. of easily bleached cellulose fibers suitable as a cotton substitute and usable directly in a cotton spinning mill and also as raw material for the manufacture of paper, nitrocellulose, etc., according to the process described in 156,709 (above), the material is subjected to a preliminary softening by H_2O retting in open vats, in which it is left for 3-6 days at $30-50^\circ$, washed, subjected to hydrolysis, and then to a preliminary opening up by means of an org. solvent such as ether, petroleum ether, alcohols, CS_2 , acetone, CCl_4 , petroleum hydrocarbons and the like, the operation taking from some hrs. to two days, at higher temps. if desired, followed by the opening up of the earlier process which may take place with slight heating ($30-50^\circ$) and may extend for one to several days. The final treatment with oleic and other fatty acids, etc., is unchanged. The sequence of the above operations may be varied.

Cellulose ester compositions. H. T. CLARK. U. S. 1,370,878-9, Mar. 8. Simple dialkyl sulfones, *e. g.*, dibutyl sulfone, are used with cellulose nitrate and usual solvents and modifying substances in the production of films, varnishes and similar products.

Cellulose ester compositions. G. LEYSIEFFER. Brit. 156,752, Jan. 7, 1921. Cellulose esters are kneaded into a plastic mass with volatile solvents, such as benzene, alc., or acetone, and rolled into thin sheets at a temp. above the b. p. of the solvent. After drying to remove all traces of the solvents the sheets are pulverized and the powder is molded under pressure at a temp. above its m. p. Fillers such as talc and coloring matter may be mixed with the ester if desired.

Cellulose acetate. S. FUJISE and KIKYŌ SEISAKUSHO (the Balloon Mfg. Co.). Japan 36,545, June 10, 1920. Twenty parts cellulose is immersed in a mixt. of 100 parts Ac_2O , 100 parts AcOH , 2-3 parts concd. H_2SO_4 and 15 parts glycerol below 25° for 3 hrs. under agitation, put into H_2O , washed thoroughly and dried below 50° .

Nitrocellulose compositions. C. CLAESSEN. Brit. 156,096, Dec. 22, 1920. Addition to 155,778 (C. A. 15, 1788). Nitrocellulose is dissolved in non-volatile liquid tricresyl esters of H_3PO_4 or thiophosphoric acid, or in the halogen substitution-products of these esters. The soln., with the addition of fillers and coloring matter, may be combined with one or more layers of fabric to form driving belts, floor coverings, etc., or may be molded under pressure into various forms for insulating and other purposes. A typical compn. contains 20-25% nitrocellulose, 28-35% tricresyl phosphate, 15-20% chalk or fossil earth, 2-5% English red, and 3.5-15% finely ground sawdust.

Regenerating articles of viscose or similar material. A. D. CONLEY and E. C. STILLWELL. U. S. 1,371,800, Mar. 15. In regenerating articles formed of material such as viscose, the articles are subjected to a soln. of "sol. castor oil" and treated with caustic alkali, in order to form threads, films or filaments. Peroxides or persalts may be added.

Washing vulcanized fiber. O. LINDER. U. S. 1,371,699, Mar. 15. Vulcanized

fiber is freed from ZnCl_2 by first washing the material in ZnCl_2 solns. of diminishing concns., first employing an acid soln. and then treating with ZnCl_2 soln., the concn. of which is diminished at a uniform rate by electrolysis.

Water-resistant paper. W. HOSKINS. U. S. 1,370,650, Mar. 8. H_2O -resistant paper or cardboard is prepd. by mixing an insol. fatty acid soap such as Ca oleate directly with the stock from which the paper or cardboard is formed.

Waterproof paper. K. SAITÔ and K. NAGATA. Japan 36,492, June 3, 1920. Ten g. glue are dissolved in 400–1,000 g. H_2O by boiling, and 3–5 g. formalin and 80–20 g. glycerol are added. The soln. is used as sizing for paper.

Repulping paper. J. M. BURBY. Brit. 154,670, Aug. 22, 1919. In transforming old paper containing raw or ground wood pulp into chemical pulp, it is first reduced to pieces of convenient size in known machines and the ink and coloring-matter may be removed therefrom with alkali at a temp. below 212°F . To obtain a sulfite pulp light in color and usable for high grade book paper without bleaching, the material is boiled in a soln. of bisulfite of Ca, Mg, or Na. Darker pulp or "kraft" may be obtained by boiling with Na_2SO_4 , with or without NaOH and Na_2CO_3 . Na_2S and other chemicals containing Na, S, and CaO in different forms and proportions may be used. Boiling is preferably carried out under pressure, and after boiling, the material is beaten and washed in a beating engine, and may then be bleached and pressed into sheets for shipment.

Cardboard. Soc. VEUVE E. BARON ET CIE. Brit. 156,636, Jan. 6, 1921. In the manuf. of impermeable and rigid cardboard, ordinary cardboard is immersed in a boiling bath containing paraffin, ceresin, stearin and resin, pressed and "dried." The product may be used for roofing, packing-boxes, partitions, "protecting floors," elec. switchboards, and the like.

Size. EXPORTINGENIEURE FÜR PAPIER- UND ZELLSTOFFTECHNIK GES. Brit. 156,513, Jan. 5, 1921. In the sizing of paper and fabrics by means of a soln. of animal size, gelatin, and the like, caustic soda or lactic acid is added to the soln. for the purpose of enabling it to be more readily absorbed.

Size. EXPORTINGENIEURE FÜR PAPIER- UND ZELLSTOFFTECHNIK GES. Brit. 156,514, Jan. 5, 1921. In the sizing of paper and fabrics with animal size, casein, etc., the size is hardened by CH_2O , added either before or after application to the material.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Preliminary studies for H. M. factory, Gretna, and study for an installation of phosgene manufacture. WM. MACNAB. *Ministry of Munitions, Dept. of Explosive Supply*. 145 pgs.—This document gives examples of the actual studies made for the cotton waste, gun-cotton, nitroglycerin, nitric acid, cordite and boiler sections of the plant at Gretna with the detailed records of the study for a proposed installation for the manuf. of phosgene. In organizing the Factories Branch of the Dept. of Explosives Supply Mr. Kenneth P. Quinan introduced methods of studying the various problems and he insisted that the steps in a calcn. should be set forth so distinctly that they could be easily followed by others. These are now published here and concretely illustrate the principal of systematically and carefully calcg. the quantities of raw materials and finished products, at all stages of the processes, so that plant of proper size and a well balanced works can be constructed. In addition there are given 24 large sized folded plates showing detailed plans for machinery and app. and flow sheets for each of the intermediate and final products, together with the descriptions of the operations, and detailed specifications. The methods followed apply to the manuf. of other chemical

products than those made at Gretna and the publication must prove of great value to students of chemical engineering.

CHARLES E. MUNROE

Manufacture of black blasting powder. C. D. PRICKETT. *The Hercules Mixer* 3, 61-84(1921).—A precise and detailed description of the manufacturing operations with numerous photographs of the plant and machinery, the standard granulations and a diagram of the operations.

CHARLES E. MUNROE

Phenomena of the ignition of gaseous mixtures by induction coil sparks. JOHN DAVID MORGAN AND RICHARD VERNON WHEELER. *J. Chem. Soc.* 119, 239-51(1921).—High-tension sparks produced at a gap in the secondary circuit of an induction coil when a current in the primary circuit is broken are, in general, complex. With a current in the primary circuit considerably in excess of that just necessary to produce a spark at a gap in the secondary circuit the first part, termed the "capacity component," resembles the spark obtained by a single discharge from a Leyden jar, while the second part, termed the "inductance component," resembles the break-flash obtained when a current in an inductive circuit is interrupted by the sepn. of metallic contacts. With any mixt. of CH_4 and air it was found that the "igniting-current" at first rapidly decreased as the spark-gap was widened, but that there was a well defined optimum width, after passing which each further increase resulted in a regular increase in the "igniting-current," and that the value of the width of spark-gap that enabled ignition to be effected most readily depended on the compn. of the mixt. Thus with a mixt. containing 6% CH_4 , the width of optimum spark-gap was 3.8 mm. while the amperage of the "igniting-current" was 1.08. These steadily fell in value until when an 8.5% CH_4 mixt. was tested the width was 1.6 mm. and the amperage 0.63, and then these values rose again until when the 12.4% CH_4 mixt. was tested the width of optimum spark-gap rose to 4.5 mm. and the amperage to 1.52. From many expts. the conclusion is reached that within certain limits, dependent on the compn. of the mixt., the dimensions of a spark have an inappreciable effect on its igniting power but a decrease in the concn. of energy eventually requires that a greater quantity shall be supplied.

CHARLES E. MUNROE

Studies on the nitrotoluenes. VI. The three-component system; p-nitrotoluene, p-nitrotoluene, 1,2,4-dinitrotoluene. JAMES M. BELL AND EDWARD B. CORDON. *J. Ind. Eng. Chem.* 13, 307-8(1921). **VII. The three-component system: o-Nitrotoluene, o-nitrotoluene, 1,2,4,6-trinitrotoluene.** JAMES M. BELL AND FLETCHER H. SPRY. *Ibid* 308; cf. *C. A.* 15, 438.

CHARLES E. MUNROE

Dangers in using low-grade foreign detonators. CHARLES E. MUNROE. *Bur. Mines. Repts. of Investigations* No. 2226, 2 pp.(1921).—It is good practice to employ in all instances and with all high explosives a high-grade detonator, even though the explosive is normally sensitive to lower-grade detonators. Many explosives, even dynamite, which are sensitive when newly made become progressively less sensitive with time; in many instances an explosive in the bore hole becomes less sensitive because of wetness of the bore hole and other causes, such as hard pressing while tamping; besides, unless extreme care is practiced in charging the priming cartridge containing the detonator into the hole, the detonator might be wholly or partly pulled out of the cartridge so as to leave an intervening space between the detonator and explosive charge. Obviously, under these circumstances, a high-grade detonator is much more likely to fire the shot than a weaker detonator would, thus greatly reducing the chances of a misfire, delayed shot, imperfect explosion, or simple ignition. In July, 1914, the Institute of Makers of Explosives unanimously voted to eliminate the manuf. and sale of detonators weaker than No. 6.

CHARLES E. MUNROE

Information about safety fuse. ANON. *The Detonator* 1, No. 3, 3-4(1921).—This is a very practical article on "safety" or "running" fuse used in blasting, giving a description of the different varieties and their construction; the role of burning and how

this is affected in handling, storage, transportation and use; the guides to selection of fuse for a given use; the special effects of storage and the condition of use.

CHARLES E. MUNROE

Determination of nitrous acid in mixed acids and waste acid (TOUSSAINT) 7. Action of Grignard reagent on certain nitric esters (Hepworth) 10.

KASR, H.: Spreng-und Zündstoffe. Braunschweig: Friedr. Vieweg & Sohn. 547 pp. M70, bound M78. For review see *Z. ges. Schiess-Sprengstoffw.* 16, 52(1921).

KOSTEVICH, M.: Trinitrobenzol und trinitrotoluol. London: P. C. Millard & Co. 38 pp. For review see *Z. ges. Schiess-Sprengstoffw.* 16, 52(1921).

Explosives. G. GIN. Brit. 157,046, March 13, 1916. Cyanamides or their derivs. rich in N are mixed with substances yielding O, such as NH_4NO_3 and NH_4ClO_4 ; paraffin also may be added. One example contains dicyanodiamide 10, NH_4NO_3 69, NH_4ClO_4 17, and paraffin 4%.

Explosives. W. ESCHBACH. Brit. 156,429, Feb. 14, 1920. Priming compns. are made by mixing Pb azide with Pb trinitroresorcinate or other explosive compds., in the presence of a phlegmatizing liquid of low b. p., e. g., benzene in which a small quantity of resin has been dissolved. The benzene is evapd. off, but the resin remains in the compn.

Explosives. A. WOHL. Brit. 157,058, July 5, 1920. High molecular polymerization products of C_2H_2 , as described in 146,258 (C. A. 14, 3533), are used as absorbents for liquid air in the manuf. of blasting-cartridges.

Nitrated glycols in explosives. J. BARAB. U. S. 1,371,215, Mar. 15. Propylene glycol such as may be obtained by chlorinating oil gas and hydroxylating the product is nitrated with mixed HNO_3 and H_2SO_4 . The product, which corresponds generally in compn. to propylene glycol dinitrate, is washed and stabilized by treatment with NH_3 solns. of successively increasing strength, beginning with 0.25% soln., allowed to stand for several days, rewashed and again treated with NH_3 solns. and borax soln. and dried *in vacuo*. The product is highly resistant to shock, is but slightly volatile, will not freeze even at -40° but merely becomes thick and viscous at -50° when kept at this temp. for 15 to 20 min. and undergoes no substantial decompn. until heated above 140° . It forms a stiff gel with 15% its wt. of nitrocellulose containing 12.25% N and is suitable for general use in mixed explosives as a substitute for nitroglycerin, over which it has the advantages of being non-freezing and more stable.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Sodium sulfide determination in the dye-baths for sulfur colors. W. HERBIG. *Z. angew. Chem.* 34 (Aufsatzteile) 89-92(1921).—The usual trade method is to dissolve 10 g. of the substance in 500 cc. of water, and of this soln. 100 cc. are titrated directly with I_2 to estimate $\text{Na}_2\text{S} + \text{Na}_2\text{S}_2\text{O}_3$. To 100 cc. of the original soln. are then added 100 cc. of ZnSO_4 soln. (50:1000) and after filtering, 100 cc. are titrated with I_2 . The Na_2S content is then calcd. by difference. The method used in these expts., however, consisted in a titration with ZnSO_4 soln. using sodium nitrocyanoide ($\text{Na}_2\text{NOFe}(\text{CN})_2 \cdot 2\text{H}_2\text{O}$) as an indicator. Comparison of the 2 methods in analyzing pure Na_2S solns., dye-baths, and solns. of S colors, led to the following conclusions: (1) The ZnSO_4 titration will yield results in agreement with those obtained by the I_2 method, and it can therefore replace this method. (2) In the usual dye-baths the ZnSO_4 can be used for control

tests, for which it will give uniform results. In fresh solns. of the S dyes, however, slightly divergent values are obtained—a phenomenon which has not yet been explained. (3) The decomp. action of the dyestuff on the Na_2S in the prepn. of dyeing liquors is, under certain circumstances, so strong that 50 to 80% of the Na_2S is consumed. The addition of soda appears to have only a slight effect on this action—the cause of which is not yet understood.

SIDNEY D. KIRKPATRICK

Cloths for mechanical uses. J. W. COX, JR. *Chem. Met. Eng.* **24**, 613-8(1921).—A classification is given as to specific uses and to different industrial groups of cloth made principally from cotton, wool, asbestos, silk, and linen. A tabulation of the cloths entering into the manuf. of textiles is included.

W. H. BOYNTON

Size (Brit. pats. 156,513-4) 23.

HERZFELD: Technical Testing of Yarns and Textile Fabrics. Revized Ed. London: Scott, Greenwood & Sons. 17s. 6d.

MÖHLAU, RICHARD AND BUCHNER, HANS TH.: **Farbenchemisches Praktikum, zugleich Einführung in die Farbenchemie und Farbereitechnik.** 2nd Ed. revized. Berlin and Leipzig: Vereinigung wissenschaftl. Verleger Walter de Gruyter & Co. M45. For review see *Chem. App.* **8**, 40(1921).

SCHOFIELD, JOHN: **The Science and Practice of Scouring and Milling.** Huddersfield: Netherwood, Dalton & Co. 231 pp. 15s. net. For review see *J. Soc. Dyers Colorists* **37**, 95(1921).

SÜVERN, K.: **Die künstliche Seide, ihre Herstellung, Eigenschaften und Verwendung.** 4th Ed. revized. Berlin: Julius Springer. M160. For review see *Deut. Färber-Ztg.* **57**, 329(1921).

WHITTAKER, C. M.: **Testing of Dyestuffs in the Laboratory.** London: Heywood & Co., Ltd. 100 pp. 12s. 6d.

The Wool Year Book, 1921. Manchester (England): Marsden & Co. 13th Ed. 611 pp. 7s. 6d. For review see *J. Soc. Dyers Colorists* **37**, 69(1921).

Disazo dye. W. M. RALPH. U. S. 1,371,979, Mar. 15. A disazo dye is obtained by diazotizing 1-amino-4-nitronaphthalene-6(or -7)-sulfonic acid, coupling with *m*-amino-*p*-cresyl methyl ether, rediazotizing and coupling the diazotized intermediate with 2,8,6-aminonaphtholsulfonic acid. The Na salt of the dye is a bluish black powder and the dye gives bluish shades.

Dyes; dyeing. NATIONAL ANILINE & CHEMICAL CO., INC. Brit. 156,663, Jan. 6, 1921. A primary disazo dye is obtained by coupling one mol. part of diazotized *p*-nitroaniline or acetyl-*p*-phenylenediamine in acid soln. with one mol. part of 1,8,4-aminonaphtholsulfonic acid, and coupling a further mol. part of diazotized *p*-nitroaniline or acetyl-*p*-phenylenediamine in alk. soln. with the resulting azo dye, and finally reducing or saponifying the product. The dye gives greenish black shades on cotton, wool, silk, artificial silk, or mixed goods, and may be diazotized on the fiber and coupled with β -naphthol, *m*-phenylenediamine, *m*-tolylenediamine, resorcinol, etc.

Artificial hemp. K. NISHIYAMA AND N. TAKIZAWA. Japan 36,544, June 10, 1920. Cotton thread is immersed in H_2SO_4 (40-60° Bé.) for 10-60 min. for prepn. of hydrate, washed completely with H_2O , sepd. from H_2O , treated with alkali hydroxide (38° Bé.) for a short time, washed and dried.

Artificial cotton. U. SEKI. Japan 36,479, May 31, 1920. Rice-straw, wheat-straw or sea-weed, etc., is immersed in a mixt. of 1 part Na_2S (5-6° Bé.), 2 parts NaOH (35° Bé.), and 5 parts $\text{Ca}(\text{OH})_2$ soln. (2-3° Bé.) for 120-200 hrs., sepd. from the soln. by pressing, treated with soap soln., washed with dil. acid, bleached with NaOCl

(4–6° Bé.), washed with H_2O and sepd. from it, immersed in ammoniacal soln. of oleic acid, and then in the mixt. of alum soln. (2–3° Bé.) and NaCl and dried.

Proofing fabrics. V. MSHLER, Segeltuchweberi Akt.-Ges. Brit. 156,776, Jan. 7, 1921. The web passes over stretching bars through a liquid in a trough containing alum or acetate or sulfate of Al, etc., between pressure rollers, then round guide rollers and between sprays of a soln. of soap, oil, wax, paraffin, or the like, then between pressure rollers and finally to drying app. A suitable app. is specified.

Treating hair for textile purposes. A. O. TROSTEL. U. S. 1,371,951, Mar. 15. Hairy material of unimpaired gloss but porous texture is prepd. by treating cow hair with milk of lime containing a small amt. of Na_2S for several days and washing and drying cold.

Composition for treating canvas. C. J. NETHERCOTT. U. S. 1,371,258, Mar. 15. A compn. for waterproofing and preserving canvas is formed of varnish 5 qts., Japan sizing 3 qts., beeswax 25 oz., glycerol 25 oz., eucalyptus oil 10 oz. and a thinner such as gasoline or turpentine 2 gals.

Apparatus for spinning artificial silk. J. C. PRIMS. U. S. 1,371,113, Mar. 8.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Casein paints. CH. COFFIGNIER. *Rev. chim. ind.* 28, 399–402(1919).—Outline of the methods used at the lab. of the technical branch of the artillery. Moisture is detd. by drying 10 g. to const. wt. at 105°. Casein is detd. on 2 g. by detg. N by the Kjeldahl method; if Prussian blue is present it must first be removed with alc. and HCl. Na_2CO_3 2 g. of the powder are heated for 15 min. on the H_2O -bath with 10 cc. of HCl and 20 cc. of H_2O , filtered, washed, pptd. with H_2S , filtered, the excess of H_2S driven off, Fe and Al are pptd. with NH_4OH , and Ca with $(NH_4)_2C_2O_4$. The filtrate is evapd. to dryness, the NH_4 salts are volatilized, and the remaining NaCl is weighed. If the paint is white, it may be ignited in Pt, taken up with water, treated with NH_4OH and $(NH_4)_2C_2O_4$, filtered, and treated as above. White paints usually contain $CaCO_3$ as pigment. This is detd. by dissolving the residue on the filter from the Na_2CO_3 detn. in dil. HCl and detg. the CaO in the soln. If there is $BaSO_4$, it remains on the filter. Yellow pigments usually contained chrome yellow, $BaSO_4$, and $CaCO_3$. Two g. are heated with 10 cc. HCl and 20 cc. H_2O as before, filtered, the residue is ignited and weighed, giving $BaSO_4$. In the filtrate the Pb is pptd. with H_2S , filtered, redissolved in HNO_3 , and detd. electrolytically, and calcd. to $PbCrO_4$. The filtrate is boiled to drive off the H_2S , Cr_2O_3 and Al_2O_3 pptd. with NH_4OH , and weighed. The Cr_2O_3 is calcd. from the $PbCrO_4$, and the difference gives Al_2O_3 . For accurate work, the Cr_2O_3 should be detd. by fusion. CaO is detd. in the filtrate by pptn. with $(NH_4)_2C_2O_4$. Blue pigments have generally a Prussian blue base. It is dissolved as above, filtered, ignited, and weighed, giving Fe_2O_3 and $BaSO_4$. The Fe_2O_3 is dissolved out with HCl and the $BaSO_4$ filtered off, ignited, and weighed. The Fe is pptd. with NH_4OH and weighed as Fe_2O_3 . In the original filtrate the Al is pptd. with NH_4OH , filtered, ignited, and weighed; the CaO is pptd. from the filtrate with $(NH_4)_2C_2O_4$; and the filtrate is treated as above for the detn. of Na_2O . Green paints contain chrome yellow and Prussian blue. After treating with HCl and filtering in the usual manner, the residue on the filter is treated as indicated for blue paints; and the filtrate as indicated for yellow paints. Black paints contain mineral blacks. C, SiO_2 , Fe_2O_3 , Al_2O_3 , and $Ca_3P_2O_8$ are usually detd. Loss on igniting till white gives (H_2O + casein + C). The residue is fused with fusion mixt., and the SiO_2 detd. in the usual manner. CaO and P_2O_5 are detd. in sep. aliquots of the soln. P_2O_5 is calcd. to $Ca_3P_2O_8$, and the excess

CaO to CaCO₃. Miscellaneous paints contain colored earths, *e. g.*, ochers, siennas, etc. One or more typical analyses from each class are given. A. P.-C.

Determination of size of particles and its application to the paint industry. I. C. A. KLEIN AND W. HULME. *J. Oil Colour Chemists Assoc.* 3, 177-96(1920).—Screening is the simplest method for detg. particle size, but it is necessary to use an absolutely standardized test if results are to be of any value. Wet screening is the most satisfactory. The rate of subsidence of particles in a liquid medium is greatly influenced by the proportion of solid to medium; and expts. show that the rate of subsidence in the top layer is a measure of the concn. of fine particles present but gives no information about the coarse particles. Weighing fractions settled out at fixed intervals gives more valuable results. Microscopic detn. of av. particle size is of some value when the particles are approx. all of one size, but when their size varies to any considerable extent results are very unreliable because of the extremely small sample with which one is compelled to work. Satisfactory results are obtained by K. and H. by using a modified Schoene elutriator in which particles of various sizes in a 50-g. sample of the pigment are sepd. according to their rate of fall in a suitable medium. In this app. (illus.) a stream of the medium flows upward through a suspension of the pigment at a known rate and pressure, and discharges through a jet into a receiving vessel, where the pigment, which has been carried along, may be filtered out, weighed and examd. Microscopic examn. of the fraction is facilitated by projecting the field on a screen. Results are charted by the block method. This method applied to BaSO₄ ground in an end runner mill shows that grinding is complete in 8 min.; longer grinding produces no improvement, and it appears that a condition of equil. is set up and a certain mechanical sizing is created whereby the material acts as a lubricant. Results show the advantage of a mill from which the fine material is removed by screening, air flotation, or other means, during the grinding process. Investigations of relation between particle size and bulk-ing figure, oil absorption, settling of particles in paint films, etc., are being made. Discussion of the paper emphasizes the use of a medium which is chem. inert toward the pigment. Fractional settling of pigments in paint films may be observed by exposing a white Pb-BaSO₄ paint film to H₂S and examg. a cross-section under a microscope. The BaSO₄ will be found in the lower section of the film. F. A. WERTZ

Notes and suggestions on the manufacture and use of metallic soaps in paint and varnish making. HENRY A. GARDNER AND R. E. COLEMAN. *Paint Mfrs. Assoc. of U. S., Circ.* 120, 42 pp. (Feb. 1921).—Review. The authors present general considerations on the manuf. of pptd. and fused soaps, principles of saponification, prepn. of fatty acids, a table showing quantity of NaOH and H₂O-sol. metallic salts necessary to use with various fatty oils and resins for producing pptd. soaps, and give details of the prepn., properties, and uses of linoleates, oleates, resinates, stearates, and tungstates of Al, Ca, Co, Pb, Mn, and Zn as used in the paint and varnish industry. F. A. WERTZ

Historical sketches of colors for painting. W. ANTHONY, JR. *Farben-Ztg.* 26, 1126-7, 1189-90, 1315-6, 1380-1(1921).—Painting was first practiced by the Egyptians and from them spread in order to the Assyrians, Persians, Grecians, Etruscans, and Romans. The earliest pigments were colored earth with vehicles such as H₂O, milk, egg white, blood, etc. F. A. WERTZ

The testing of varnishes. HANS WOLFF. *Farben-Ztg.* 26, 1186-7(1921).—Varnishes used on locomotives and other surfaces exposed to combustion gases may be tested by placing varnished panels in a belljar to which SO₂ and CO₂ have been admitted in known proportions. The panels are allowed to remain 8 days to 8 wks. For a more severe test the gases are preheated. Results are relative and final comparisons are made by observing the films microscopically, testing their behavior to rubbing under the fingers, etc., both on removal from the gas and after several days. F. A. WERTZ

New methods used in the examination of oil of turpentine. H. SALVATERRA. *Chem. Ztg.* 45, 133-5, 150-1, 158-9(1921).—S. gives a complete historical review of the analytical methods used in evaluating turpentine. Several of these methods have been critically studied. Exptl. data were obtained on various samples of turpentine (of known source and purity) to which varying amts. of solvent naphtha, tetrahydronaphthalene (tetralin), etc., had been added. Of Tausz' 3 proposed methods for the detct. of adulterants in oil of turpentine (C. A. 13, 1023), only that which involves the use of mercuric acetate in the oxidation of pinene gives accurate results. Mercurous acetate (suggested as oxidizing agent by Nicolardot and Clement, *Petroleum* 1918, p. 649) is entirely unsatisfactory. The bromination method proposed by Allina and Salvatterra (C. A. 15, 181) has been reinvestigated and modified so as to apply to other pine oils besides turpentine. S. has also devised a new *iodination method*, which gives very satisfactory results. A 20-cc. sample of turpentine is gradually added to a cooled mixt. of 80 g. I, 104 g. HgCl_2 and 200 cc. alc. The soln. is allowed to stand in the dark for 6 hrs. and is then treated with sufficient concd. KI soln. to dissolve the HgI_2 , followed by a slight excess of $\text{Na}_2\text{S}_2\text{O}_3$. The colorless soln. is then neutralized with Na_2CO_3 and steam-distd. The distillate is quant. collected in a flask with graduated neck, and the % (by volume) of the adulterants detd. L. E. WISE

Material and dopes for the planes of airplanes. A. FUCHS. *Chimie & industrie* 3, 167-72(1920).—Details are given of the various materials used for planes and of the dopes or varnishes used to render them waterproof. Cellulose acetate and other materials used as bases for the dopes are discussed, as well as the most appropriate solvents. Materials for increasing the plasticity of the film when dry and for reducing its liability to fire, the methods of applying the dopes, of drying the films, and of recovering the vaporized solvents are considered. J. S. C. I.

Changes in powdered rosin by the action of air and moisture. F. GOLDSCHMIDT AND G. WEISS. *Z. deut. Oel-Fett Ind.* 41, 147-8(1921).—It has been observed that higher figures for available rosin substance were obtained by the stearin method (C. A. 13, 1942) when the rosin was in lump form than when powdered. Samples of different rosins were, therefore, powdered and exposed to air and to air and moisture and analyzed and the results compared with those on the same rosins in lump form. The above observation was fully confirmed and the suggestion is made that air and moisture produce in powdered rosin a water-sol. oxidation product which during analysis escapes soln. in ether. P. ESCHER

The manufacture of sealing wax. MAURICE DE KEGHEL. *Rev. chim. ind.* 29, 107-112(1920).—A good grade of sealing wax should be clear, smooth, brilliant in luster, and should melt without giving off fumes or disagreeable odors. It should not soften so as to fall in drops, and after the impression is made, it should be similar in appearance to the original wax. The seal should break easily, and without crumbling. The chief constituents of a good sealing wax are gum lac, mastic, sanarac, benzoin, and turpentine, while the cheaper grades contain rosin and pitch. The perfume used in the better grades are the essential oils and balsams. In the cheaper waxes, inert substances are added to increase weight and volume. The gums used are selected carefully for color, and often the original gum must be decolorized by melting. This should be done over a steam bath because the gum loses in plasticity when heated over an open flame. Turpentine counteracts this loss of plasticity, however. Venice turpentine is used with gum lac ordinarily for high-grade waxes. For cheaper grades, rosin dissolved in spirits of turpentine is used. The former requires filtering generally. The process used in making a high-grade red wax consists of melting 7 kg. of gum lac at a low heat (gas heat or a sand bath) with const. stirring, and then adding successively 4 kg. of Venice turpentine, 1 to 2 kg. of vermilion, and 70 g. of MgCO_3 . The latter is added to offset the weight of the coloring material added. Then the mass is stirred vigorously

and constantly to prevent the pigment from settling. When homogeneous, the mass is tested by dropping a small globule on a glass plate, and examg. it for color, hardness, and texture. If satisfactory the flame is lowered to keep the mass fluid, and 130 g. of Peruvian balsam are added with stirring. Then the mass is poured into molds of the desired shape, and cooled, rapid cooling being avoided. Formulas and complete instructions are given for making high grade and cheaper grades of waxes in various colors such as white, blue, yellow, green, brown, black, silver, and golden, as well as multi-colored, ivory, and transparent waxes. The last operations carried out are polishing and stamping; these are described in detail. A. J. LEWIS

The action of trichloroethylene upon pine resin (GOLDSCHMIDT, WEISS) 27. Distilling mineral oils, resins, etc. (Brit. pat. 156,539) 22.

SABIN, A. H.: *Red-lead and How to Use it in Paint*. 3rd Ed. rewritten and enlarged. New York: John Wiley & Sons. 139 pp. 11s. 6d. net. For review see *Chem. Trade J.* 68, 420(1921).

Paints and pigments. Y. NISHIZAWA. Brit. 156,971, Nov. 25, 1919. Substantially neutral org. compds. containing two or more hydroxyl groups are mixed with metallic sulfides or substances contg. metallic sulfides, for the purpose of obtaining a pigment or paint compn. which will resist the action of light and heat. In examples, ZnS is treated with the above mentioned class of compds., among which may be included glycol, the saccharides, and salts and esters of tartaric and polyhydroxystearic acids. Treated in this manner, ZnS undergoes no perceptible change when exposed to ultraviolet rays for 5-6 hrs. or is heated gradually to a temp. of 120°. Several methods of mixing the two ingredients are given. The sulfide may be incorporated with the org. compd. itself, or with its aq. soln. ZnS may be added to the latter and, after settling, the clear liquor poured off and the deposit removed and dried. Or the sulfide may be pptd., for instance by means of $(\text{NH}_4)_2\text{S}$, in the presence of the org. compd. Finally the "preventer" may be formed in the presence of the metallic sulfide. E. g., $\text{Zn}(\text{OAc})_2$ may be added to a suspension of ZnS in tartaric acid, and the ZnS soaked in the resulting Zn tartrate removed and dried.

Red paint. S. MATSUSHITA. Japan 36,463, May 28, 1920. A mixt. of 1.2 lbs. β -naphthol, 0.35 lb. NaOH, 0.5 lb. soda ash, 0.5 lb. AcONa , 10 lbs. CaCO_3 and 10 lbs. kieselguhr is mixed with a diazo soln., prepd. from 1 lb. *p*-nitroaniline, 2 lbs. HCl (20° Bé.), and 0.5 lb. NaNO_2 ; about 20 lbs. para-red formed. The red is mixed with a suitable quantity of Cr red and oil for the paint. Kieselguhr and CaCO_3 serve to prevent pptn.

Mixing white lead with oil. A. S. MOSKES. U. S. 1,371,926, Mar. 15. Dry white lead and pulp white lead are mixed with oil and this mixt. is successively added to additional portions of oil.

"Lead-flattening" material for paints. W. E. WRIGHT. U. S. 1,370,575, Mar. 8. A lead-flattening compn. for use in lead paints is formed of tung oil, mixed with another oil such as soy-bean oil, which retards the drying of the tung oil, and with a heavy-body resin gum and oil varnish.

Turpentine substitutes. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 156,250, Jan. 4, 1921. 1,2,3,4-Tetrahydronaphthalene is used as a substitute for turpentine in the production of paints, varnishes, polishes, etc.

Coating compositions. H. PLAUSON and J. A. VIELLE. Brit. 156,149, Dec. 31, 1920. Colloidal solns. of the suspensoid type of certain bases in dispersion media with or without the addition of accelerating agents are made by intensively grinding the base and medium in a high-speed mill. The base may first be rolled with a liquid

capable of swelling it or dissolving it. Examples of bases are: resins, polymerized vinyl compds., phenol-HCHO condensation products, natural or artificial rubber; of dispersion media: benzene and its homologs, terpenes, chlorohydrin, chlorinated hydrocarbons, ketones, esters, org. acids, alcs., oils, or mixts. of these; of accelerating agents: NH_3 and its org. derivs., soaps, resinsates, sulfonated oils, phenols, aniline. An *adhesive* may be obtained by thickening the product by distn. *in vacuo*.

Linseed-oil substitutes. D. SCHOONDERWALDT. Brit. 155,508, May, 26, 1920. A substitute for linseed oil is prepd. by boiling 100 lb. of crude petroleum and 4 lb. of methylated spirit with 10 lb. of CaO and 10 lb. of pipe-clay for 2 hrs., filtering through linen or jute, and adding 10 lb. of stand oil while stirring.

Ink. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,212, Jan. 3, 1921. Aq. solns. of lactates, including lactates of color bases, are used instead of glycerol in printing and stamping colors. *E. g.*, 10 kg. of crystal-violet are dissolved in a mixt. of 75 l. of H_2O , 15 l. of methyl alc., and 25 kg. of aq. K lactate soln. of sp. gr. 1.45.

Synthetic resins. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,068, Jan. 6, 1921. Synthetic resins, homologous with coumarone and indene resins, are obtained by polymerizing with concd. H_2SO_4 the tar-oil fractions from carbolic or creosote oils which boil between 190 and 240° and are free from coumarone and indene. The starting material is first freed from naphthalene by freezing and then from tar oils by extr. with alkali. The products of polymerization are isolated by distn. of the non-polymerized oils; they are useful for the manuf. of varnishes.

Synthetic resins. CHEMISCHE FABRIKEN WORMS AKT.-GES. Brit. 156,740, Jan. 7, 1921. Oil-sol. condensation products are obtained from aromatic hydroxy compds., acid lignite tar oils, or low-temp. tar oils containing phenol, by condensation with not more than a mol. proportion of acetaldehyde or its polymers or higher aldehydes or mixts. thereof. The addition of these oil-sol. resins to phenol-formaldehyde resins which are insol. in oil converts them into sol. products. After-treatment of the oil-sol. resins with an aldehyde such as HCHO converts them into oil-insol. products.

Synthetic resins. H. PLAUSON and J. A. VIELLE. Brit. 156,151, Dec. 31, 1920. Synthetic resins are produced by effecting the condensation between phenols and HCHO or its polymers in the presence of vinyl compds. or their polymerization products, or by adding the vinyl compd. or its polymerization product to the phenol-aldehyde compd. Suitable vinyl compds. are vinyl acetate; chloro-, hydroxy-, amino-, and arylacetic esters; propionic esters; polymerized vinyl esters; vinyl halides, *e. g.*, vinyl chloride; and vinyl esters, such as vinyl ethyl or vinyl propyl ether. The reaction is accelerated by the addition of small quantities of an org. anhydride, or superoxide, or non-explosive ozonide. The products are used for the prepn. of *varnishes*; they take up certain oils and esters to form non-fragile products capable of cutting and molding; and when dissolved in a low-boiling solvent, they can be used for the impregnation of wood, paper, cellulose, asbestos, graphite, etc. They can be stuck together by softening their surfaces with chlorinated hydrocarbons, *e. g.*, chlorobenzene, dichlorohydrin, epichlorohydrin, or mesityl chloride.

27—FATS, FATTY OILS AND SOAPS

E. SCHERUBEL

Wool fat. VII. I. LIFSCHÜTZ. *Z. physiol. Chem.* 110, 29-40 (1920).—The acid radical of this fat is a satd. fatty acid. Its I value is due to some oxidation product of cholesterol.

H. V. ATKINSON

Comparison of methods for estimating the iodine number of fats. W. DEVRIENT. *Ber. pharm. Ges.* 30, 361-6 (1920); *J. Chem. Soc.* 118, II, 779.—Estns. of the I no. of

elaic acid yielded *via* Huebl 80.3, Waller 80.0, Winkler 80.8, Wijs 80.8, Hanus 82.5. D. prefers the last method as being the most simple and rapid, and because the result obtained is nearer the theoretical value 90, than are those obtained by other methods.

W. O. E.

The Twitchell reagent. E. HOYER. Charlottenburg. *Z. deut. Oel-Fett Ind.* **41**, 113-5(1921).—The aromatic sulfo fatty acid of the Twitchell reagent does not hydrolyze fats by itself but only emulsifies them; the true cleavage agent is the H_2SO_4 that accompanies it. The results of a series of 82 expts. are tabulated from which the following conclusions are drawn: (1) Increase of H_2SO_4 , of HCl or of pure naphthalenesulfonic acid accelerates hydrolysis in direct proportion to the added acid. (2) Hydrolysis decreases to the same extent to which the H_2SO_4 is washed out. (3) Small amts. of Na_2SO_4 , $NaHSO_4$ and Na acetate added prevent hydrolysis by uniting with H_2SO_4 to form $NaHSO_4$ or Na_2SO_4 ; $MnSO_4$ and $CaSO_4$ also prevent hydrolysis, probably by forming insol. salts of the aromatic sulfo-fatty acid; $NaHSO_4$ exerts no influence; SO_2 , formic acid and AcOH retard cleavage for some unknown reason. (4) Substitution of the fatty acid by wool fat, rosin or coumarone resin or substitution of the aromatic constituent by tetralin did not furnish active reagents. Regarding the cause of the darkening of the fatty acids the following conclusions were drawn: (1) The fatty acids discolor more readily than neutral fats. (2) The darkening depends directly upon the amt. of H_2SO_4 in the reagent. (3) Least darkening is produced by the smallest quantity of reagent and smallest addition of H_2SO_4 . (4) The speed of reaction is dependent directly upon the amt. of reagent and added H_2SO_4 . (5) Different oils differ in susceptibility to discoloration. The author confirms Twitchell's statements that distd. H_2O should be used for cleavage because Mg and Ca salts depress activity. Fats of high acidity should not have their glycerol water changed. When fats of high glycerol content necessitate a H_2O change, H_2SO_4 should be added prior to the 2nd boiling. If the second glycerol H_2O is used for a fresh charge, its acidity should not be neutralized with lime; $BaCO_3$ might be used.

P. ESCHER

Determination of the hydroxy fatty acids in sulfur olive oils. F. LIEBL. *Z. deut. Oel-Fett Ind.* **41**, 178(1921).—As different benzines gave different results in pptg. hydroxy fatty acids, 7 sulfur olive oils of different origins were tested with 4 benzines as follows: (I) b. 40-65°, d. 0.683, (II) b. 65-85°, d. 0.707, (III) b. 70-80°, d. 0.705, (IV) b. 44-76°, d. 0.681. The results obtained were as follows:

Sample.	I.	II.	III.	IV.
S 1	3.0	2.7	2.2	4.0
S12	13.2	14.7	13.1	14.1
T57	4.6	4.3	3.5	4.9
T76	1.9	2.1	1.1	1.8
T114	4.8	4.5	4.5	5.2
B46	3.8	3.9	2.9	4.0
B225	7.0	6.8	3.9	7.3

F. Goldschmidt and G. Weis found that a small amt. of benzene hydrocarbons added to the different benzines gave practically const. results. The sepd. and purified hydroxy fatty acids were examd. as follows: neutralization no. 148, Morawski rosin reaction negative; the Na soaps were sol. in H_2O and were pptd. in the cold with NaCl; with heat they formed lumps which could not be melted.

E. SCHERUBEL

Estimation of coconut and palm-kernel oils in fat mixtures in which both oils may be present. W. N. STOKOS. *J. Soc. Chem. Ind.* **40**, 57-8T(1921).—In the standard Reichert-Polenske process after distg. 110 cc. cool the liquid and collect the insol. acids on a filter; rinse the condenser with 20 cc. of warm H_2O , pouring the water over the filter, and wash the paper with warm H_2O . Fill several capillary tubes 1 mm. in internal

diam. to the depth of $\frac{1}{2}$ in. with the melted acids, and attach 2 of the tubes to a thermometer graduated to 0.1° . Fit the thermometer into a test tube by means of a cork, and support the tube in a beaker contg. ether, the surface of which should be above the level of the acids in the capillary tubes. If the acids are solid it is necessary to warm the ether to 30° . Force a gentle stream of air through the ether so as to lower its temp. gradually until the temp. of the ether is 2° below that of the capillary tube thermometer. At the first appearance of crystals note the temp. Mixts. contg. only coconut and palm-kernel oils alone gave the following results: coconut oil 85%, seeding point 11.80° ; 75%, 13.40° ; 60%, 15.50° ; 50%, 16.90° ; 40%, 17.90° ; 25%, 19.50° ; 10%, 21.80° . Of four samples of coconut and palm kernel oil of different origins the av. seeding points were 10.75° and 22.75° , resp. Two tables are given showing the results with mixed fats, the presence of which raises the seeding point. Thus in the analysis of an unknown fat mixt. it is necessary first to obtain the approx. quantity of the coconut group of fats present by detg. the sapon. no. and the R.-P. value. Reference is then made to the corresponding line or intermediate line if necessary on the graph diagram, and from this the relative proportions of coconut oil and palm kernel oils are read off.

E. SCHERUBEL

Problems in the preparation of copra and coconut oil. HARVEY C. BRILL. *Chem. Met. Eng.* 24, 567-8(1921).—A summary of the work of the Bur. of Science, Manila, on the prepn. of copra and coconut oil (C. A. 12, 434-435), followed by suggestions for further investigations. Improved methods for drying copra are needed. The use of SO_2 or vacuum driers may prove satisfactory. Data on the best process for pressing copra and the optimum working conditions for pressing are at present lacking. If a solvent process is developed the solvent used should not have too low a b. p. for use in the tropics and must leave a cake with an oil content low enough to make it suitable for fertilizer. Attempts to sep. coconut oil from fresh coconuts have so far been unsuccessful, but such a method appears desirable as all drying difficulties would then be eliminated and the residual cake might be available for food and feeding stuffs.

H. S. BAILEY

Determination of the hexabromide number of fatty oils. A. EIBNER. *Farben-Ztg.* 26, 1314-5(1921).—E. criticizes the method of Bailey and Baldisien (C. A. 15, 603) for detg. the hexabromide no. of linseed fatty acids.

F. A. WERTZ

Fuller's earth and its application in the oil industry. SEIICHI UENO. *J. Chem. Ind. (Japan)*, 23, 1028-33(1920).—Nineteen expts. are cited to show that both fish and vegetable oils can be purified when treated with Japanese fuller's earth at 120° for 20 min. The fuller's earth absorbs metallic soaps and their impurities which act as poisons in the hydrogenation of the oils. When hardened oil is treated with this, the content of Ni and other ash constituents is greatly diminished. American fuller's earth acts in the same way. A chem. analysis of the oil of dike whale, *Balaenoptera borealis* Lesson, is also given. After purification with the fuller's earth, it gave the following consts.: d_{40} 0.9224, acid no. 0.24, sapon. no. 185.2, I no. 144.2, acetyl no. 3.2, Hehner no. 96.0, $[\alpha]_{20}^{20}$ 1.4754, butyrefractometer reading at 20° 75.0 and unsapon. matter 0.7%. When hardened, it m. 58° and has acid no. 0.4, I no. 3.0.

S. T.

Soap from fatty acids. WILLIAM B. NANSON. *Cotton* 85, 424(1921).—Soaps of the best quality are obtained only by boiling glycerides with NaOH.

NATHAN VAN PATTEN

Glycerides and their properties. WILLIAM B. NANSON. *Cotton* 85, 426-7(1921).—The homologous properties of the glycerides in their application to soap making are shown by a table in which the theoretical yield of anhydrous soap from various glycerides is given. In another table are given the actual and not the theoretical percentages of NaOH and KOH required in practice to saponify commercial fats and oils.

NATHAN VAN PATTEN

Curd, grain or settled soap. WILLIAM B. NANSON. *Cotton* 85, 423(1921).—The manuf. of curd, grain or settled soap is discussed. Pure commercial soaps made by this process contain about 30% of water and not more than 63–64% of fatty acids. Such soaps are called "genuine soaps." The theoretical compn. of a genuine soap made from neutral glycerides, having the mean mol. wt. of about 800 (tallow, olive oil, etc.) is fatty anhydrides 61.60, combined Na_2O 7.18, water plus small quantities of inorg. salts and glycerol 31.22%. It is generally conceded that a commercial soap containing a higher percentage of fatty materials or a lower percentage of water cannot be made in a soap kettle.

NATHAN VAN PATTEN

Glycerol. WILLIAM B. NANSON. *Cotton* 85, 424(1921).—The lyes obtained in the soap-making process by boiling oils and fats in an open pan with NaOH contain practically all the glycerol which the natural oils and fats are capable of yielding. According to the manner in which the charges are worked up in making the soap, the spent lyes contain 5 to 8% of pure glycerol. The Van Ruyvnebeke and Glatz processes are briefly described.

NATHAN VAN PATTEN

Hydrogenated phenols and their use in the soap industry. W. SCHRAUTH. Berlin. *Z. deut. Oel-Fett Ind.* 41, 129–32(1921).—In order to dispense with the importation of the costly turpentine and benzine, the hydrogenation of naphthalene has been developed to produce tetralin and adekalin as substitutes. Phenol is now hydrogenated to produce cyclohexanol as a substitute for amyl alc., while hydrogenation of acetone will furnish isopropyl alc. as a substitute for EtOH. Crude cresol furnishes by hydrogenation a mixt. of *o*-, *m*-, and *p*-methylcyclohexanol, b. 170–180°. Cyclohexanol is an oily liquid, b. 160°, d. 0.945, flash p. 68°. It dissolves to a clear soln. like amyl alc. in ordinary soap soln. and may thus serve as a substitute for the imported sulfonated castor oil, much used in the textile industry, and also for benzine-sol. soaps which require the presence of free fatty acids. K, Na or NH_3 may be used as a base for tetralin soaps. A satisfactory liquid product, for example, is obtained by simply agitating 600 kg. hexalin (cyclohexanol) with 500 kg. olein, 200 kg. 50° Bé. KOH and 400 kg. H_2O and dilg. the product with NH_4OH . Settled soaps take up 10 to 20% of hexalin without much loss of hardness when formed into cakes. It is recommended that the hexalin be incorporated in the form of an aq. soln. of K oleate, because hexalin alone would increase the viscosity of the soap in the kettle sufficiently to prevent agitation. These soap mixts. do not readily salt out, resembling castor oil in this respect; their lathering ability can be increased by keeping the soap on the acid side; they form clear solns. with H_2O contg. Ca salts. On account of their unusual cleansing power these soaps are preferably used for wool scouring and for chem. cleansing; their terpene-like odor is not unpleasant nor injurious and when used in the laundry they leave no odor in the finished wash. In dry washing the soap content of the benzine can be much increased by the use of hexalin soaps, thereby diminishing the danger of benzine explosions. The emulsifying power of hexalin soaps fits them for use as cutting or boring oils (Ger. pat. 332,909) and as floor wax and shoe polish (Ger. pat. 331,050) or for rapid sapon. of wool grease and waxes.

P. ESCHER

The time factor in saponification. PERCIVAL J. FRYER. *Analyst* 46, 87–90(1921).—The statements of various observers on the relative velocities of sapon. of fats and oils are conflicting. Numerous references are cited. Using a mixt. of Et_2O and abs. EtOH, F. studied the comparative velocities of sapon. of fats and oils typical of marine, drying, semi-drying, and non-drying oils and animal and vegetable fats. He concludes that the velocity of sapon. of fats and oils, from the point of view of the amt. of free alkali removed from the reacting soln., is in inverse ratio to the sapon. equiv. or the mean mol. wt. of the fatty acids of the glycerides. Comparative results can be obtained only if the temp. is the same in all tests, as an increase of 7–8° doubles the velocity. Solvents also affect the sapon. rate; the alcohols show an increased velocity in direct pro-

portion to their mol. wts. In EtOH the speed is over 10 times that in MeOH and in AmOH double that in EtOH. The following procedure is suggested for detg. the rate of sapon. Weigh 2 g. of the sample and the same quantity of a pure ester into a 100 cc flask, and add 20 cc. Et₂O, and 25 cc. of 0.5 N EtOH-KOH. Cork and allow to stand 30 min. All the liquids should be at identical temps. and remain so. At end of the reaction period run in an excess of 0.5 N HCl and titrate back with 0.5 N alkali. Compare sapon. of oil with that of the pure ester. No experimental data are submitted.

H. S. BAILEY

Saponification of tallow. WILLIAM B. NANSON. *Cotton* 85, 426-7(1921).—Brief discussion. Tallow requires a caustic lye of comparatively low density for satisfactory sapon.

NATHAN VAN PATTEN

Saponification of cottonseed oil. WILLIAM B. NANSON. *Cotton* 85, 427(1921).—Brief discussion. Refined cottonseed oil saponifies with difficulty and only after continued boiling, especially when saponified alone. A good settled soap of cottonseed oil alone is not practicable.

NATHAN VAN PATTEN

The hydrolytic alkalinity of pure and commercial soaps. F. C. BEEDLE AND T. R. BOLAM. *J. Soc. Chem. Ind.* 40, 27-29T(1921).—McBain and others (*C. A.* 8, 2290; 13, 666) having shown that the hydrolysis of soap solns. is unexpectedly slight, pure and commercial soaps were examd. by the nitrosotriacetone-amine method (for references and method of calcn. see original). The hydrolysis-alkali of Na oleate passes through a max. at a concn. of 0.05 N and while negligible at high concn. increases rapidly in dil. solns. Na palmitate shows about the same hydrolysis-alkalinity as Na oleate and Na rosinate, but in stronger solns. the oleate is less and the rosinate is more hydrolyzed in correspondence with their varying degrees of colloidalilty. Since pure coconut oil soap exhibits a very low degree of hydrolysis, it can not produce a skin irritation due to alkali. Possibly laurates may be irritating. The hydrolytic alkalinity of soap solns. is essentially that produced by the most hydrolyzable constituent. Free alkali accounts for only a fraction of the alkalinity in any well made soap. Cold-process and toilet soaps made from the same materials do not differ appreciably in this respect, the alkalinity being too small to have an effect even upon sensitive skin.

JEROME ALEXANDER

The action of trichlorethylene upon pine resin. F. GOLDSCHMIDT AND G. WEISS. *Z. deut. Oel-Fett Ind.* 41, 99-100(1921).—If stearin is saponified together with pine resin which has been extd. by C₂HCl₃ a heavy, black residue forms in the soap kettle. This sediment is due to impure C₂HCl₃, which during the war contd. a considerable amt. of constituents boiling above 88°:

	During war.	Purified.	Kahlbaum.
Distn. begins at °C	75°	72°	71°
1st fraction, up to 86°	3.97%	82.8%	3.02%
2nd fraction, 86-88°	74.70	15.25	76.38
3rd fraction, above 88°	11.43	0.56	16.88
Final temp.	118°	88.5°	106.0°
Residue	10.80%	0.66%	2.40%

Solns. of resin in the above 3 samples of C₂HCl₃ were air-blown for 12 hrs. in the presence of Fe and only the purified solvent showed absence of black sediment. When the various distd. fractions were subjected to the same test, none formed a sediment except the portion distg. above 88°. Analysis of a black and brittle technical residue as obtained from a soap factory contd. 7.0% H₂O and 32.8% ash. The ash contd. 3.4% alkali calcd. as Na₂CO₃, 8.5% NaCl, 3.9% Fe and 2.5% Al. By sapon. and liberation of the fatty acids there were found 18.5% ether-sol. and 35.3% ether-insol. but alc-sol. acids, the former consisting of 6.04% resin acids of sapon. no. 178.1 and

8.04% fatty acids of sapon. no. 219.4, 2.2% having become insol. during sepn. The 35.3% insol. acids were a brown-black powder of sapon. no. 189.4 which yielded 6.2 % of water-sol. Na salt upon sapon. When turpentine is used as a solvent for resin and is air-blown in the presence of Fe a similar black residue is formed while amyl alc. under the same conditions turned black and formed a slimy sediment which could not be sepd. from the soap. P. ESCHER

Notes and suggestions on the manufacture and use of metallic soaps in paint and varnish making (GARDNER, COLEMAN) 26. Extraction of glue and fats (Brit. pats. 156,645-7) 29. Cooling and solidifying fats (Brit. pat. 155,477) 12. Apparatus for the manufacture of feeding stuff and recovery of fat (Ger. pat. 323,118) 12.

DOOREMANS, L. F.: *Analysen betreffende hebbende op de vet en olie-industrie*. Groningen: P. Noordhoff. 111 pp. f3.50, bound f4.25. For review see *Oliën en Vellen* 5, 458(1921).

Fatty acids. H. PLAUSON and J. A. VIERLE. Brit. 156,141, Dec. 31, 1920. Saponifiable fatty acids are obtained from paraffins by treatment with compressed air or O at temps. of 120-150°, or *soaps* may be obtained directly by oxidizing in the presence of an alkali. In one example, paraffin is treated for 10-15 hrs. with O at a pressure of 5-10 atms. in a conical vessel provided with a heating-coil or jacket. The volatile products, amounting to 16-18% of the paraffin, are withdrawn through an adjustable valve and condensed. 60-70% of the paraffin is converted into saponifiable matter, and the remaining non-volatile portion can be emulsified in the soap. If air is used instead of O, it is preferably preheated and freed from moisture and CO₂, and its action may be assisted by the use of O-containing catalysts. In other examples, paraffin, or a mixt. of paraffin with montan wax or ceresin, is mixed with 20-30% of alkali or alk. earth oxidized as in the previous case, and heated with steam under pressure.

Fatty acids. J. STARRELS. Brit. 155,782, Dec. 23, 1920. Fatty acids for making soap, candles, etc. are prepd. and purified by hydrogenating, in presence of a catalyst such as Ni, oil or fats such as corn, cottonseed, coconut, fish, or whale oil, tallow, grease, etc., until the oil has a m. p. of 60-62° and an iodine number of 0-2, splitting the hydrogenated oil by the Twitchell or other process, dissolving the fatty acids obtained in a heated solvent such as denatured alc. or gasoline, and sepg. the fatty acids by cooling. The fatty acids are pressed to remove residual soln. which carries away hydrocarbons and coloring matters formed during the hydrogenation.

Extracting fat, waxes, gelatin, etc. SCOTT AND CO., LTD. Brit. 155,863, July 17, 1919. In the extn. of fat, waxes, gelatin, etc. the steam is circulated continuously through the extractor by a jet or other compressor and pipes. Steam to compensate for losses may be added through a pipe, and a superheater may be introduced into the circuit. The fat etc. passes through the false bottom into a receiver. In a modification the pipe is connected with the receiver. A suitable construction is specified.

Purifying fats and oils. H. BOLLMANN. U. S. 1,371,342, Mar. 15. Impurities such as free fatty acids are removed from rape oil or other fats or oils by passing a continuous current of alc. or other solvent of the impurities through successive chambers of a countercurrent leaching app. and in each chamber permitting the solvent to pass upwardly and the oil downwardly through a mass of stationary filling material such as Raschig rings to secure intimate contact with a minimum of emulsification.

Hydrogenating oils. Y. FUJIMURA and NAIGAI SHINTAKU SHOJI KABUSHIKI KAISHA. Brit. 157,057, June 14, 1920. In app. for hydrogenating fatty oils a pump withdraws oil containing the catalyst from the lower part of the treating vessel and returns it through a rotary spraying device in the upper part of the vessel, comprizing a

number of tubes with peripheral apertures from which the oil is projected as a spray on to a screen of active Ni gauze rotating in the opposite direction; H withdrawn from the upper part of the vessel is forced by a compressor into the body of oil in the lower part, through nozzles inclined so as to set up a rotary movement in the oil, which, however, is broken up so as to secure intimate contact of the oil and H, by an agitator carried by the shaft of the spraying device and rotating in the opposite direction. The driving shaft is submerged in the oil so as to obviate leakage of H through its gland; and in the lower part of the well of oil, the heating coil is provided. The Ni gauze is rendered active by treatment with HNO_3 , and subsequent reduction. A suitable construction is specified.

Extracting oils. P. SCHNEIDER. Brit. 156,722, Jan. 7, 1921. The oil in rape seed, etc., is expressed, collected, and stored *in vacuo*. A suitable app. is specified.

Soap. P. L. E. PECH. Brit. 156,591, Jan. 3, 1921. About 2.64% of KClO_3 or other strong oxidizing agent is added to soap to enable it to be used with sea water. The soap preferred is prepd. from 70 kg. "cocoa oil," 1.55 kg. anhydrous NaOH, and 4.28 kg. anhydrous KOH.

Soap. E. T. LADD. U. S. 1,370,824, Mar. 8. An antiseptic soap for toilet or laundry use is formed with sufficient occluded Cl gas to give the soap antiseptic and bleaching properties and to enable it to float.

Rosin, soap emulsions. J. A. DANCEW. U. S. 1,370,884, Mar. 8. Hot rosin soap containing free rosin is violently agitated with about 7 times its vol. of hot H_2O and is then further dild. with colder H_2O to produce a sizing compn.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Refraction and dispersion of sugar solutions. HUGO KRÜSS. *Z. Ver. Zuckerind.* 70, 617–25 (1920).—K. gives a new fundamental table of the refractive indexes of aq. sugar solns. at 20°, based on a perfectly smooth curve which was constructed from the actual observations. The new values closely approach those found by Schönrock (*C. A.* 5, 2575), but show a somewhat greater divergence from Main's figures (*C. A.* 1, 3062). Compared with the results by direct analysis, Main's figures av. 0.27% too high, Schönrock's figures 0.19%, and K.'s 0.14%. The reason for these differences is not known. As regards the effect of temp. on the indexes of refraction, Schönrock's results appear to be correct, as they have not been questioned. The relative dispersion of sugar solns. of varying concn. has been recalcd. by K., and the values for $(n_D - 1)/(n_F - n_C)$, ranging from 56.4 at 0 to 65.0 at 100 dry substance, are given in a table.—Applying his results to the Schönrock refractometer, K. finds that the construction of the optical parts is the best that can be devised for this type of instrument, except that the refracting angle of the compensating prism should be a little over 44° instead of 42.7°. With the larger angle the compensation would be good for concns. from 0 to 60%, and fair up to 80%.

F. W. ZERBAN

Recovery of sugar from beet molasses. WALLACE MONTGOMERY. *Chem. Met. Eng.* 24, 605–8 (1921).—A detailed description of the Steffens and strontia processes is given, with flow sheets, and figures on recoveries and losses; illustrated.

F. W. ZERBAN

The utilization of waste molasses in the Philippine Islands, with special reference to the haciendas of Negros. H. J. CARSTEN. *Philippine J. Sci.* 17, 395–407 (1920).—The disposal of waste molasses is becoming a troublesome problem, particularly on the island of Negros, with its rapidly growing sugar industry. The following methods of possible utilization are described, and their advantages and disadvantages are discussed:

use as fuel, either by itself, or in conjunction with bagasse; manuf. of alc., and of K_2O from the vinasse; of solidified molasses; of cattle feeds; of fuel gas; of sugar by the Battelle and Steffens processes; of charcoal and K_2O ; of Ca acetate and acetone; of glycerol. Manuf. of alc., of solidified molasses, and of cattle feed are of special interest under Philippine conditions.

F. W. ZHRBAN

Windrowing sugar cane in the Northwest Frontier Province. I. The effect on the economical and agricultural situation. W. ROBERTSON BROWN. II. The effect on the composition of sugar cane. W. H. HARRISON AND P. B. SANVAL. *Mem. Dept. Agr. India, Chem. Ser.* 5, 237-46(1920).—Windrowing, a term used to describe a farm practice of protecting cane from frost, is practiced successfully in the Pershawar valley. The juice deteriorates in purity somewhat, but becomes more concd. The amt. of sucrose in windrowed cane increases rapidly at first, for a period remains const., then deterioration sets in.

J. J. SKINNER

Observations upon the Clerget method. C. A. BROWNE. *Facts About Sugar* 12, 230(1921).—B. discusses the Bureau of Standards formulas and conclusions arrived at in the tables published in *Bull.* 375, which indicate that the modified Clerget method is capable of indicating the sucrose content of a mixt. with a high degree of accuracy. Exptl. evidence is presented for different values of the positive and negative constituents of the Clerget factor. The discrepancy is pointed out in the work of Jackson and Gillis between the tables arrived at and the formulas used. This cannot be accounted for by compensation and B. maintains that both are in error.

N. KOPELOFF

The application of the Clerget method to dilute sugar solutions. R. F. JACKSON AND C. L. GILLIS. *Facts About Sugar* 12, 190(1921); cf. *C. A.* 15, 1416.—Conclusions arrived at in *Bull.* 375, of the Bureau of Standards, are given, indicating that the modified Clerget method is capable of indicating sucrose content of a mixt. with a high degree of accuracy.

N. KOPELOFF

Evaporation versus fractional freezing for concentrating light juice. JÁN POKORNÝ. *Listy Cukrovar.* 38, 321-3(1920).—Comparative theoretical calcs. show that for each 100 kgs. of beets in process about 13,500 more calcs. would be necessary for the concn. of the light juice by utilization of fractional freezing than by the use of evaporation under reduced pressure. Also in *Z. Zuckerind. czechoslov. Rep.* 44, 195-6(1921).

JOHN M. KERNO

Simplified formula for finding the extraction of different mills. BÉCHARD. *Bull.*

assoc. suc. dist. 38, 113-5(1920).—B. develops the formula, $x = \frac{(100B' - bS)}{(B' - S)}$ in which

x is the extn. of all mills up to and including the one whose extn. is desired, B' is the % sugar in the bagasse on leaving this mill, b is the total normal juice of the cane, and S is the % sugar in the normal juice. By solving for 2 successive mills the extn. of the second is obtained by the difference.

I. D. GARARD

Chemistry of potato starch manufacture. H. TRYLLER. *Chem. Ztg.* 44, 833-4, 845-7(1920).—Ordinary potato starch may be considered to be the Ca salt of starch-phosphoric acid, the anhydrous substance having the formula $(C_6H_{10}O_5)_n(OH)PO_3Ca$, where n has a value of 260, corresponding with a P_2O_5 content of 0.165%; a part of the Ca is, however, always replaced by Mg, K, Fe and Mn. In the potato itself, the starch is present as the K salt, but during the process of prepn. the K is replaced by Ca derived from the water used for washing the starch. The Ca may also be replaced by heavy metals.

J. S. C. I.

Industrial classification of starches and flours (ARPIN) 12. Determination of maltose and lactose in the presence of other reducing sugars (LEGRAND) 7.

MUNKER, FRANZ: Condensed Description of the Manufacture of Beet Sugar. New York: John Wiley & Sons. 175 pp. \$2.50 net.

The South African Sugar Journal Annual. Durban: The S. African Sugar Journal, 42 Commercial Rd. 311 pp. 7s. 6d. For review see *J. fabr. sucre* 62, No. 8, 2(1921).

Purifying sugar juices. E. DELAFOND. U. S. 1,371,997, Mar. 15. Sugar juices or sirups are subjected to an elec. current between electrodes, to purify them, while agitated sufficiently to prevent substantial deposition of material on the electrodes.

Purifying sugar and other liquids. J. N. A. SAUER. Brit. 155,609, June 20, 1919. Liquids of progressively decreasing purity all derived from liquid of the same character are passed successively through a filter containing a certain amt. of finely divided decolorizing C; the C is finally mixed with the most impure liquid and then sepd. from it. The liquid may receive preliminary treatment by means of a decanting app. or centrifugal separator or with a purifying agent in a tank. Kieselguhr, fuller's earth, charcoal, lime, carbonate and phosphate of lime, Na_2HPO_4 , and CaSO_4 are mentioned as suitable purifying agents for this preliminary treatment. A preliminary filter may also be used. A suitable construction is specified.

29—LEATHER AND GLUE

ALLEN ROGERS

Factors influencing the viscosity of glue. F. J. CRUPI. *Chem. Met. Eng.* 24, 575-6(1921).—High-grade glues consist of larger colloidal molecular aggregations than those of lower grades; hence their solns. offer more resistance to flow. The relative internal dispersity of the molecular groups and the varying attraction of their molecules also are factors. Chemicals variously affect the size of the mols. and "colloids" in glue, some acids increasing dispersion and lowering viscosity, while formaldehyde increases both. "Generally the *jelly strength* of a glue varies with its viscosity." The strength of a glue jelly depends upon the concn. of the mols. or the quantity of the mols. which make up the colloids. The factor of dispersion also affects jelly strength. It does not follow that a glue with a strong jelly should always have a high tensile strength.

JEROME ALEXANDER

Methods for testing glue. HUGO HILLIG. *Farben-Zig.* 26, 1331-2, 1394-5(1921); cf. C. A. 15, 1080.—A brief review of various tensile-strength and jelly tests, detn. of N content, etc. on glues.

F. A. WERTZ

JETTMAR, JOSEF: Die Eisengerbung, ihre Entwicklung und jetziger Zustand. Leipzig: Schulze & Co. M 20. For review see *Chem. Weekblad* 18, 130(1921).

Coloring leather. J. H. PFINGSTEN. U. S. 1,371,572, Mar. 15. A pulverulent, insol. pigment such as burnt sienna mixed with other pigments is suspended in H_2O and leather is agitated in the suspension accompanied by heating to effect impregnation of the interstices of the leather by the pigment.

"Ferro-leather." W. MENSING. U. S. 1,371,803, Mar. 15. Tough and durable leather is produced from animal skins by tanning them in a soln. of oxidized Fe sulfate or other iron salts containing an excess of an oxidizing agent, e. g., HNO_3 , and dil. acid, and then treating the skins with a reducing agent, e. g., $\text{Na}_2\text{S}_2\text{O}_4$.

Tanning. S. SUGIHARA. Japan 36,502, June 3, 1920. Softness and strength are given to leather by tanning it, fastened by wooden lattice, owing to the coexistence of perfectly and imperfectly tanned parts.

Tanning. **CHEMISCHE FABRIKEN WORMS AKT.-GES.** Brit. 156,670, Jan. 6, 1921. Hides are tanned with the heavy metal salts (other than Al or Cr salts) of synthetic tanning agents of the kinds described in 156,254. According to examples there are employed products obtained as followed: Tar phenols b. 185–200° are heated with Na_2SO_3 and HCHO soln., the product is acidified with H_2SO_4 and the SO_3 boiled off, and the product finally neutralized with ceric hydroxide; a mixt. of naphthalene and phenol is sulfonated and condensed with HCHO soln., and the product is neutralized with potash and ceric hydroxide. The products may be used alone or mixed with other tanning agents.

Tanning agents. **CHEMISCHE FABRIKEN WORMS AKT.-GES.** Brit. 156,669, Jan. 6, 1921. Synthetic tanning agents of the kinds described in 156,254, are converted into heavy-metal salts other than those of Al or Cr; these salts also are tanning agents. According to examples: tar phenols b. 185–200° are heated with Na_2SO_3 and HCHO soln., the product is acidified with H_2SO_4 and the SO_3 boiled off, and the product finally neutralized with ceric hydroxide; a mixt. of naphthalene and phenol is sulfonated and condensed with HCHO soln., and the product is further condensed with tannin and HCHO soln., and finally neutralized with potash and ceric hydroxide. The products may be used in tanning alone or mixed with the other tanning agents.

Synthetic tanning agents. **CHEMISCHE FABRIKEN WORMS AKT.-GES.** Brit. 156,749, Jan. 7, 1921. Synthetic tanning agents of the kind described in 156,254, and 156,669 (preceding pat.) are converted into basic salts of heavy metals, which also are tanning agents. According to an example, a mixt. of naphthalene and phenol is sulfonated with H_2SO_4 and condensed with HCHO soln., the product is converted successively into the Ca salt and the Na salt, a soln. of the Na salt is mixed with a soln. of two mol. parts of CrCl_3 , and the basic salt is prepd. by adding NaOH. The products may be used in tanning, alone or mixed with other tanning agents, by the usual methods.

Tanning extracts. **A. A. A. M. J. M. E. H. RIALLAND (née PERCEVAULT).** Brit. 156,653, Jan. 6, 1921. Tannin-containing materials (wood, bark, or leather) are extd. by alkali solns. From the filtered ext. the tannin is pptd. as an insol. metal tannate, which is then decomposed by an acid, such as H_2SO_4 or oxalic. A reducing agent, such as a sulfite, may be added in the alkali extn. to prevent oxidation of the tannin, or the extn. may be performed in a non-oxidizing atm. When sawdust or shavings are treated any alkali-cellulose formed is pptd. by neutralizing the alk. ext. by an acid, before pptn. of the metal tannate.

Extraction of glue and fats. **K. NIESSEN.** Brit. 156,645, Jan. 6, 1921. Glue is extd. from bones, gristle, leather waste, animal skins, fish waste, etc., by steeping in H_2O boiling under vacuum or pressure, the steam generated during the steeping of one batch of the material being condensed for use in the steeping of another batch, while the resulting evapn. increases the concn. of the glue liquor. A suitable app. is specified.

Extraction of glue and fats. **K. NIESSEN.** Brit. 156,646, Jan. 6, 1921. An app. for the extn. of glue from bones, gristle, leather waste, animal skins, fish waste, etc., consists of a battery of extractors in which (1) steam and H_2O act alternately on the material in an automatic manner for as many times as there are extractors in the battery and (2) a uniform high degree of concn. results from each extn. Suitable app. is specified.

Extraction of glue and fats. **K. NIESSEN.** Brit. 156,647, Jan. 6, 1921. Addition to 156,646. The app. described in the principal patent for the extn. of glue and fats from bones, gristle, leather waste, animal skin, fish waste, etc., is modified by (1) employing only one extractor, and (2) constructing the extractor of two compartments, in each of which low-pressure steam and H_2O boiling under reduced pressure act upon the material in an alternate manner, the steam in one while the H_2O is in the other. A suitable app. is specified. Cf. preceding abstract.

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Vinyl halides and esters and their polymerization products (synthetic rubber) (Brit. pat. 156,117) 10. Diolefins and their polymerization products (Brit. pat. 156,116) 10.

Annuaire technique du caoutchouc et de la gutta percha et des industries qui s'y rattachent. Paris: La rev. sci. ind. et commerciale "Le caoutchouc et la gutta-percha" 49 rue des Vinaigriers. 246 pp. 30 fr. For review see *Chem. Weekblad* 18, 40(1921).

Rubber. S. C. DAVIDSON. Brit. 155,344, June 20, 1919. The greater part of the air or gas and H_2O contained in raw rubber freshly coagulated is eliminated by perforating the rubber in the form of a layer by means of a number of pins forced through it from one surface to the other before subjecting it to further treatment, e. g., by means of rollers. The process may be repeated for several positions of the rubber layer. A suitable construction is specified.

Synthetic rubber. H. PLAUSON and J. A. VIELLE. Brit. 156,119, Dec. 30, 1920. Diolefins or certain polymerization products thereof are converted into rubber-like substances by subjection to very high pressures for some time at atm. temp. Known accelerators may be employed, those mentioned being NaOH, wood oil, NH_3 , NH_4HCO_3 , and urea compds. The starting material may be butadiene, isoprene, piperylene, dimethylbutadiene, or Kondakov's polymerization product prepd. from 1,3-dimethylbutadiene. According to examples, the pressure may be generated in the following ways: (1) liquid butadiene is placed in an autoclave and N is forced in until the pressure attains several hundred atms.; (2) a pressure vessel is charged with isoprene cooled to the temp. of liquid air, a little liquid NH_3 is added, and the vessel sealed and allowed to attain atm. temp.; (3) a metallic tube containing dimethylbutadiene with or without benzene is sealed, and the tube then flattened; (4) an emulsion of a mixt. of isoprene and dimethylbutadiene in H_2O containing an emulsifying agent, such as albumin, gelatin, or hemoglobin, is forced into the piston space of an app. like a hydraulic press; (5) a mixt. of butadiene and dimethylbutadiene is forced into a pressure vessel with liquid CO_2 .

Rubber compositions; synthetic rubber; vulcanizing rubber. H. PLAUSON and J. A. VIELLE. Brit. 156,118, Dec. 30, 1920. The properties of synthetic rubber produced by the polymerization of unsatd. hydrocarbons, such as isoprene, butadiene, piperylene or 1,3-dimethylbutadiene, are modified by the addition prior to polymerization of $CH_3:CHCH:NCH_3$, or its homologs, prepd. by condensing an alkyl or aryl amine with acrolein. By increasing the proportion of the amine deriv. relative to the hydrocarbon, the product becomes harder and acquires the properties of vulcanized rubber. Thus, one part of the amine deriv. polymerized with 7 parts of the hydrocarbon gives a rubber which can readily be vulcanized; with equal parts of the amine deriv. and the hydrocarbon, a product resembling both rubber and leather is obtained; while with 7 parts of the amine deriv. to 1 part of the hydrocarbon, a substance resembling ebonite is produced. In addition, the rate of vulcanization of synthetic or natural rubber can be accelerated by the addition of the acrolein-amine compd.

Rubber substitutes. H. PLAUSON and J. A. VIELLE. Brit. 156,143, Dec. 31, 1920. A mixt. of a fatty acid and fish oil or other vulcanizable oil is treated with SCl_2 . For a soft-rubber substitute, 100 parts of linseed oil are mixed with 10 parts of oleic acid and 10 parts of a 10% rubber soln., and 20 parts of SCl_2 are added. The mixt. is dild. with 20 parts H_2O and neutralized with 15% NH_3 soln., then evapd. to a viscous condition, dried and heated to 240° . For an ebonite substitute the viscous mass is mixed

with metallic oxides and Sb_2S_3 , with or without filling and coloring matters, pressed and dried *in vacuo* at 50-70°. When completely dry the substance is submitted to a further pressure of 6 atms. for 6 hrs.

Rubber substitutes. H. PLAUSON and J. A. VIELLE. Brit. 156,144, Dec. 31, 1920. Addition to 156,143 (preceding patent). In the manuf. of rubber-like masses from a mixture of a vulcanizable oil and a fatty acid, as described in the principal patent, flowers of S is used as a vulcanizing agent. In an example, 100 parts of fish oil, 15 parts of oleic acid and 15 parts of S are mixed and heated in an autoclave to 115-240° for 1-5 hrs. Fatty acids of the acrylic series may be used up to 50% of the wt. of oil. The mixts. if only partly vulcanized are suitable for use as *varnishes*.

Rubber mixture. R. C. HARTONG. U. S. 1,370,965, Mar. 8. An aqueous suspension of $Al(OH)_3$ is added to rubber and the H_2O is driven off, before vulcanization, in order to secure uniform admixture of the ingredients.

Reclaiming waste rubber. H. PLAUSON and J. A. VIELLE. Brit. 156,150, Dec. 31, 1920. Waste rubber free from fibrous matter is highly dispersed by treatment in a colloid mill with H_2O or an org. medium such as benzene or petroleum. The dispersion may be accelerated by the addition of soaps, colloids such as glue, starch, dextrin, albumin, casein, etc., or rubber solvents, and the sepn. of the S is facilitated by the presence of alkalis, amines, or $(NH_4)_2S$. The free and combined S is ultimately removed from the rubber and is filtered off as colloidal soln. or treated with org. solvents, leaving the dispersed rubber in a form resembling latex. The process may be carried out at temps. between 15 and 20°.

Rubber-proofed fabrics. L. MINTON. Brit. 155,469, Jan. 20, 1920. Rubber-proofed goods are provided with a permanent lustrous finish, resembling silk, by applying a film or coating of powdered mica to the surface of the coated fabric while the rubber is in an adhesive condition, or the powdered mica may be incorporated with the rubber before it is applied to the fabric. The powdered mica may be applied to the rubber-coated fabric by printing thereon a mixt. of it suspended in rubber, resin, or oil thickening. The mica-finished surface of the coated fabrics, either before or after vulcanization, may be printed, embossed, or schreinered to produce the appearance of textile or woven silk, etc.

Apparatus for recovering gasoline in rubber manufacture. R. TSUCHITA. Japan 36,503, June 3, 1920. Gasoline, evapd. by heating or agitation, is sucked into an absorbing machine with air, in which it is absorbed by machine oil. The gasoline is recovered by distn.

Vulcanizing rubber, etc. SOC. R. ALLENBY ET CIE. Brit. 157,050, March 18 1920. Furfuramide and other N furfuryl derivs. are used as accelerators in vulcanizing rubber. Several furfuryl derivs. are mentioned in addition to furfuramide, in particular the condensation products of pyromucic aldehyde with NH_3 or amines.

Vulcanizing accelerator. C. W. BEDFORD. U. S. 1,371,662, Mar. 15. A vulcanizing accelerator is formed by reaction between S and thiocarbaniide, *p*-phenylenediamine or similar compds.

Vulcanizing accelerator. C. W. BEDFORD. U. S. 1,371,663, Mar. 15. An accelerator for use in vulcanizing is formed by the reaction of S on a nitroso deriv. of an aromatic amine, *e. g.*, *p*-nitrosodimethylaniline.

Vulcanizing accelerator. C. W. BEDFORD. U. S. 1,371,664, Mar. 15. A vulcanizing accelerator is obtained by reaction of S upon a Schiff base containing a CH_3 group, *e. g.*, methylenediphenyldiamine.

Rubber balls. G. C. WORTHINGTON. U. S. 1,369,868, Mar. 1. Golf balls are formed by mixing blocks of resilient rubber with rubber cement and weighting material such as wolframite and coating a core of this mixt. with a winding of rubber thread and an outer layer of balata.

